

## 2002 ROCKY FLATS CLEANUP AGREEMENT ANNUAL REVIEW

### 1.0 BACKGROUND

The Rocky Flats Cleanup Agreement (RFCA or Agreement) was signed by the Department of Energy (DOE), the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) on July 19, 1996. (DOE, EPA, and CDPHE are collectively referred to as the "RFCA Parties.") The RFCA Parties have committed to review the Agreement to determine if any revisions are necessary. RFCA paragraph 5 states in part:

*The Parties shall conduct an annual review of all applicable new and revised statutes and regulations and written policy and guidance to determine if an amendment pursuant to Part 19 (Amendment of Agreement) is necessary.*

In addition to the annual review prescribed in RFCA paragraph 5, the agencies committed to conducting an internal annual review of the radionuclide soil action levels (RSALs). Questions to be addressed on an annual basis include:

1. Is there new scientific information available that would impact the interim action levels?
2. Has a national soil action level been promulgated within the year? If yes, the parties commit to revisit the Rocky Flats interim action levels.
3. How were the interim action levels applied to the site over the course of the year?
4. Have the remedies been effective?

(See, Responsiveness Summary for Soil Action Levels released on November 6, 1996.)

This report is a summary of the Parties' 2002 regulatory/radionuclide soil action levels annual review for the period July 1, 2001 through June 30, 2002.

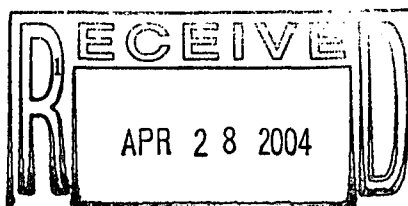
### 1.1 What the Parties reviewed this year

The following environmental laws and associated regulations, written policy and guidance were reviewed:

Comprehensive Environmental Response, Compensation, and Liability Act;  
Resource Conservation and Recovery Act/Colorado Hazardous Waste Act;  
Toxic Substances Control Act;  
Clean Water Act, Colorado Water Quality Control Act, Safe Drinking Water Act;  
National Environmental Policy Act;  
Endangered Species Act;  
Radiation Related Document Review; and  
Defense Authorization Acts and Appropriation Acts.

In addition to the above environmental laws and the radionuclide soil action levels, the Preliminary Remediation Goals (PRGs), RFCA Attachment 5, Action Levels and Standards Framework for Surface Water, Ground Water and Soils, and RFCA Appendix 3, Implementation Guidance Document (IGD) were reviewed. Summaries of these reviews are described below.

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## 1.2 Other reviews

Pursuant to RFCA paragraph 281, DOE developed, in consultation with CDPHE and EPA, a revised Community Relations Plan entitled "Rocky Flats Site-wide Integrated Public Involvement Plan" (Plan). The Plan was completed in March 1998 and is available in the Rocky Flats Public Reading Rooms. RFCA requires an annual review of this document. The RFCA Parties updated the Plan in 2002. The updated Plan will be subject to a 30-day public review and comment period at the end of 2002. A final updated Plan is scheduled for completion in mid-2003.

The Integrated Monitoring Plan was updated in 2002 and is being reviewed for FY03. An Integrated Monitoring Plan Working Group was formed including members from DOE and its contractors, EPA, CDPHE, and stakeholders.

DOE reviews and updates, as required: the Environmental Restoration Ranking (RFCA paragraph 79); the Administrative Record (RFCA paragraph 284); the summary level baseline (RFCA paragraph 141); and the Historical Release Report (RFCA paragraph 119(l)) on an annual basis. These reviews were completed in September 2002.

The Integrated Water Management Plan is also reviewed annually; the Rocky Flats Water Working Group will conduct the next review of the Integrated Water Management Plan.

For more information on any of the above documents, contact either a RFCA Project Coordinator or an Agency community relations representative.

## 2.0 ENVIRONMENTAL STATUTES

The laws, regulations, policy and guidance documents issued during this review period that may be relevant to activities conducted pursuant to RFCA are discussed below. When an amendment to RFCA or change to any RFCA Attachment or Appendix is recommended, the necessary amendment or other change is also described. Otherwise, no amendment or other changes are recommended.

### 2.1 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was not reauthorized or amended in 2002. EPA has not amended or promulgated new regulations on the National Oil and Hazardous Substances Pollution Contingency Plan; however, EPA has issued several new policies and guidance documents that may be used at Superfund sites.

1. *Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)*, December 2001. Part D provides guidance on risk assessment planning, reporting, and review throughout the CERCLA remedial process. Part D strives for effective and efficient implementation of Superfund risk assessment practice described in Parts A, B, C, and E, supplemental Office of Solid Waste and Emergency Response (OSWER) directives and other Agency risk assessment guidance. OSWER Directive 9285.7-47. (URL: [www.epa.gov/superfund/programs/risk/ragsd/index.htm](http://www.epa.gov/superfund/programs/risk/ragsd/index.htm).)
2. *Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites*, February 12, 2002. The purpose of this guidance is to help EPA site managers make scientifically

sound and nationally consistent risk management decisions at contaminated sediment sites. It presents 11 risk management principles that should be considered when planning and conducting site investigations, and selecting and implementing a response. OSWER Directive 9285.6-08.

3. *Risk Assessment Guidance for Superfund: Volume III Part A: Process for Conducting Probabilistic Risk Assessment*, April 18, 2002. This guidance document was created to establish national criteria to conduct and review Superfund probabilistic risk assessments. OSWER Directive 9285.7-45. (UTL: [www.epa.gov/superfund/RAGS3A/index.htm](http://www.epa.gov/superfund/RAGS3A/index.htm).)
4. *Role of Background in the CERCLA Cleanup Program*, May 1, 2002. This policy statement clarifies EPA's preferred approach for the consideration of background constituents concentrations of hazardous substances, pollutants, and contaminants in certain steps of the remedy selection process, such as risk assessment and risk management, at CERCLA sites. OSWER Directive 9285.6-07P.

## **2.2 Resource Conservation and Recovery Act/Colorado Hazardous Waste Act**

EPA issued a final rule in the Federal Register on October 3, 2001 at 66 FR 50332 entitled, "Correction to the Hazardous Waste Identification Rule: Revisions to the Mixture and Derived-from Rules; Direct Final Rule." The effective date of this rule was February 1, 2002. Because the rule is less stringent than current Colorado Hazardous Waste Act requirements, the State of Colorado must adopt the regulation prior to the regulation being implemented at RFETS. RFETS is monitoring the State of Colorado regulatory activities related to this rule.

On January 22, 2002 at 67 FR 2961, EPA promulgated six amendments to the 1993 Corrective Action Management Unit (CAMU) regulations:

1. Established a specific definition, distinct from the definition of remediation waste, to govern the types of wastes that are eligible for placement in CAMUs.
2. Established more detailed minimum design and operating standards for CAMUs in which waste will remain after closure, with opportunities for Regional Administrators to approve alternate design standards under certain circumstances.
3. Established treatment requirements for wastes that are placed in CAMUs, including minimum treatment standards, with opportunities to adjust treatment requirements under certain circumstances.
4. Established more specific information requirements for CAMU applications and is explicitly requiring that the public be given notice and a reasonable opportunity for public comments before final CAMU determinations are made.
5. Established new requirements for CAMUs that will be used only for treatment and storage.
6. "Grandfathered" certain types of existing CAMUs and allows them to continue to operate under the 1993 rule.

The regulation was effective on April 22, 2002. This regulation is more stringent than the Colorado Hazardous Waste Act provisions and will be applicable if CAMUs are used during RFETS actions.

EPA and CDPHE have issued several new policies and guidance documents that may be used at Superfund sites that may be relevant to RFETS:

1. TANKS Version 4.09b, posted September 27, 2001. TANKS is a Windows-based computer software program that estimates volatile organic compound and hazardous air pollutant emissions from fixed- and floating-roof storage tanks. This program is used, when necessary, for emission calculations. (<http://www.epa.gov/ttn/chief/software/tanks/index.html>.)
2. Universal Waste Rule Compliance Bulletin, September 2001. (<http://www.cdphe.state.co.us/hm/hmwhatsnew.asp>.)
3. Guidance on Demonstrating Compliance With the Land Disposal Restrictions (LDR) Alternative Soil Treatment Standards, July 2002. The purpose of this guidance is to provide suggestions and perspectives on how to demonstrate compliance with the alternative treatment standards for certain contaminated soils that will be land disposed and, therefore, will be subject to the RCRA LDR regulations. OSWER Directive 530-R-02-003.

## 2.3 Toxic Substances Control Act

Within the review period, DOE and EPA clarified implementation of EPA's Polychlorinated Biphenyls (PCBs) bulk product waste rule (40 CFR 761.62) at RFETS. Pursuant to a letter from Kerrigan Clough to Joe Legare, Approval of Risk-Based Approach for PCB- Based Painted Concrete, November 2001, concrete painted with PCB-based paints may be left in place in the basements of demolished buildings, and concrete rubble containing PCB-based paints may be stored onsite and used as backfill. This clarification will be added to the comment for 40 CFR 761.62 in the Master List of Potential Applicable or Relevant and Appropriate Requirements (ARARs) contained in RFCA Appendix 3 IGD, Appendix K, Master List of Potential ARARs.

## 2.4 Clean Water Act, Colorado Water Quality Control Act, and Safe Drinking Water Act

### 2.4.1 Clean Water Act

There were numerous federal actions taken under authority of the Clean Water Act in the period July 1, 2001 through June 30, 2002, some of which impact RFETS, either immediately or in the long term.

#### Water Quality Standards

In May 2002, EPA issued a Draft Strategy for Water Quality Standards and Criteria to lay out the long range planning for development of water quality standards. In June 2002, the agency issued draft guidance on water quality criteria for bacteria, *Implementation Guidance for Ambient Water Quality Criteria for Bacteria*. Both documents were intended to initiate public discussion leading to final development of a long-range strategy for standards and criteria and for the development of criteria for bacteria. While there is no immediate impact to RFETS, long-range planning and criteria development may lead to eventual applications to the Site. RFETS will continue to monitor regulatory activities associated with water quality standards.

#### Permit for the Management of Biosolids

EPA Region VIII promulgated a general permit for biosolids management at federal facilities in the State of Colorado. The permit was published in June 2002 for final comment. The permit covers facilities that generate biosolids from wastewater treatment and allows management by land application, disposal at a sanitary landfill or surface disposal. The general permit is applicable to the Site.

## **2.4.2 Colorado Water Quality Control Act**

### Section 309

In the 2002 legislative session, Colorado adopted a new section to the Water Quality Control Act, Section 309. In addition to authorizing changes in the permit fee structure, Section 309 also required the health department to initiate a thorough review of water quality standards and use classifications for all Colorado waters, with a special charge to consider the "unique" characteristics of the state's water. The health department has convened a work group to help guide it through this complex task. A final report from the Water Quality Control Division is due to the legislature in December 2003. Site personnel have participated in the work group to monitor progress. Water quality information collected at RFETS may be valuable in clarifying the discussion of the "unique" characteristics of state waters, especially for intermittent streams and effluent-dominated streams with periodic flow.

### Commission Actions

The Colorado Water Quality Control Commission did not take any formal action during this review period that would result in any changes to RFCA.

## **2.4.3 Safe Drinking Water Act**

No new or revised Maximum Contaminant Levels were adopted since the last update or any other changes to the Safe Drinking Water Act that would apply to RFCA activities.

## **2.5 Clean Air Act**

EPA and the State of Colorado continued to promulgate regulations under the existing Act, but the majority is not applicable to RFCA activities. Where new regulations were applicable there were no new compliance requirements. The RFCA Parties will continue to monitor regulatory activity associated with this effort.

## **2.6 National Environmental Policy Act**

No new or revised National Environmental Policy Act requirements impacting RFCA activities were proposed or promulgated during this review period. No separate National Environmental Policy Act reviews have been required or performed under RFCA pursuant to RFCA paragraph 95.

## **2.7 Endangered Species Act**

No new or revised Endangered Species Act requirements impacting RFCA activities were proposed or promulgated during this review period.

## **2.8 Radiation Related Document Review**

See, Section 3.0 Radionuclide Soil Action Levels, below.

## **2.9 Environmental Statute Summary**

Based on the review of the environmental statutes and associated regulations, written policy, and guidance, no amendment to RFCA is required at this time. However, the comment concerning Section 2.3, TSCA, PCBs, 40 CFR 761.62, will be added to the RFETS Master List of Potential ARARs (RFCA Appendix 3 IGD Appendix K).

### **3.0 RADIONUCLIDE SOIL ACTION LEVELS**

The RFCA Parties continued their review of the RSALs during the review period. The RFCA Parties worked to complete their review and document the results by September 30, 2002.

In addition to the annual review requirements prescribed in RFCA paragraph 5, the RFCA Parties also addressed the four questions discussed in the introduction. The RSAL working group reviewed questions 1 and 2 as part of its review. Findings will be discussed in a document currently in preparation, titled, *Results of the Interagency Review of Radionuclide Soil Action Levels*. Regarding question 3, interim RSALs were applied as data quality objectives for a number of accelerated actions taken at the site over the course of the review period. Finally, regarding question 4, the first CERCLA 5 Year Review for the Site has been conducted during this review period and a Draft Report was issued for a 45 day public review and comment period, which ended June 12, 2002. The Draft Report concludes that the remedies implemented for OU-1 and OU-3 are protective. The Draft Report also concludes that ongoing custody and control of the Site by DOE, monitoring programs and restrictions of public access to the Site serve to adequately control risks posed by contamination, including radionuclides, at this time. After consideration of public comments the Report will be finalized and submitted to for EPA concurrence with a final protectiveness determination.

### **4.0 RFCA ATTACHMENT 5: ACTION LEVELS AND STANDARDS FRAMEWORK FOR SURFACE WATER, GROUND WATER AND SOILS**

The RFCA Parties have identified tentative changes to action levels that impact RFCA Attachment 5. Proposed modifications to Attachment 5 will be made available for public comment in accordance with RFCA paragraph 117.

### **5.0 IMPLEMENTATION GUIDANCE DOCUMENT**

RFCA Appendix 3, IGD was reviewed by the RFCA Parties to determine if an update was necessary. The IGD, Appendix K, Master List of Potential ARARs was updated as described in Section 2.9, above.

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National Environmental Policy Act;  
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Defense Authorization Acts and Appropriation Acts.

In addition to the above environmental laws and the radionuclide soil action levels, RFCA Attachment 5, *Action Levels and Standards Framework for Surface Water, Ground Water and Soils*, and RFCA Appendix 3, *Implementation Guidance Document (IGD)* were reviewed. Summaries of these reviews are described below.

## **1.2 Other reviews**

Pursuant to RFCA paragraph 281, DOE developed, in consultation with CDPHE and EPA, a revised Community Relations Plan entitled "Rocky Flats Site-wide Integrated Public Involvement Plan" (Plan). The Plan was completed in March 1998 and is available in the Rocky Flats Public Reading Rooms. RFCA requires an annual review of this document. The RFCA Parties decided to update the Plan in 2002. A Draft update of the Plan was available for a 30-day public review and comment period that closed on November 25, 2002. Based upon consideration of comments DOE revised the Draft update for approval by CDPHE and EPA.

The Integrated Monitoring Plan is being reviewed for 2004 implementation. An Integrated Monitoring Plan Working Group was formed including members from DOE and its contractors, EPA, CDPHE, and stakeholders. The final 2004 Integrated Monitoring Plan is scheduled for completion in mid-2003.

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## **2.0 ENVIRONMENTAL STATUTES**



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The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) was not reauthorized or amended in 2003. EPA has not amended or promulgated new regulations on the National Oil and Hazardous Substances Pollution Contingency Plan. EPA has issued several new policy and guidance documents that may be used at Superfund sites.

1. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*, September 2002. This document provides assistance to CERCLA remedial project managers and human health and ecological risk assessors during the remedial investigation process to evaluate background concentrations at CERCLA sites. In addition, this document contains recommended statistical methods for characterizing background concentrations of chemicals in soil. Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-41. (URL: [www.epa.gov/superfund/programs/risk/background.pdf](http://www.epa.gov/superfund/programs/risk/background.pdf).)
2. *Calculation and Use of First-Order Rate Constants for Monitored Natural Attenuation Studies*, November 2002. This paper was published by the U.S. EPA National Risk Management Research Laboratory. It explains when and how to apply first-order attenuation rate constant calculations in monitored natural attenuation studies. First-order attenuation rate constant calculations can be an important tool for evaluating natural attenuation processes at ground-water contamination sites. Specific applications identified in U.S. EPA guidelines (U.S. EPA, 1999) include use in characterization of plume trends (shrinking, expanding, or showing relatively little change), as well as estimation of the time required for achieving remediation goals. EPA 600-S-02-500. (URL: <http://www.epa.gov/ada/download/issue/540S02500.pdf>.)
3. *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway From Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*, November 29, 2002 (67 Federal Register (FR) 71169). EPA issued a draft guidance that provides current technical and policy recommendations on determining if the vapor intrusion pathway poses an unacceptable risk to human health at cleanup sites. Vapor intrusion is a rapidly developing field of science and policy. This draft guidance is intended to aid in evaluating the potential for human exposure from this pathway given the state-of-the-science at this time. EPA will

continue to explore this area in efforts to improve the state-of-the-science of this complex exposure pathway. This OSWER guidance supercedes the Resource Conservation and Recovery Act (RCRA) guidance issued in December 2001. (Federal Register Notice - November 29, 2002.)

4. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, December 2002. This document updates a 1992 guidance originally developed to supplement EPA's Risk Assessment Guidance for Superfund, Volume 1-Human Health Evaluation Manual, which describes a general approach for estimating exposure of individuals to chemicals of potential concern at hazardous waste sites. Specifically, this 2002 guidance addresses the exposure point concentration, which is a conservative estimate of the average chemical concentration in an environmental medium determined for each individual exposure unit within a site. OSWER Directive: 9285.6-10 (URL: [www.epa.gov/superfund/programs/risk/toolthh.htm](http://www.epa.gov/superfund/programs/risk/toolthh.htm).)
5. *Transfer of Long-Term Response Action (LTRA) Project to States*, April 2003. This fact sheet identifies key elements of the LTRA transfer process and provides guidance to remedial project managers related to the transfer of responsibilities from EPA to the state for operation and maintenance of the remedy. This fact sheet is a follow up to the fact sheet entitled *Operation and Maintenance in the Superfund Program*, May 2001, EPA540-F-01-004, and provides more detailed guidance for this component of post-construction completion activities. OSWER Directive: 9355.0-81FS. (URL: [www.epa.gov/superfund/action/postconstruction/ltrafactsheet.pdf](http://www.epa.gov/superfund/action/postconstruction/ltrafactsheet.pdf).)
6. *Five-Year Review Process in the Superfund Program*, April 2003. This fact sheet summarizes the guidance document entitled *Comprehensive Five-Year Review Guidance*, EPA540-R-01-007, which was published in June 2001. The fact sheet includes information on when a five-year review is conducted, who is responsible for conducting a five-year review, and a discussion of the components of a five-year review. OSWER Directive: 9355.7-08FS (URL: [www.epa.gov/superfund/action/postconstruction/fiveyearreviewfactsheet.pdf](http://www.epa.gov/superfund/action/postconstruction/fiveyearreviewfactsheet.pdf).)
7. EPA issued a notice of availability of a final report, *Framework for Cumulative Risk Assessment*, April 2002. (Published May 27, 2003 at 68 FR 28825.) This report is the first step in a long-term EPA effort to develop Agency-wide cumulative risk assessment guidance.

## 2.2 Resource Conservation and Recovery Act/Colorado Hazardous Waste Act

EPA issued a final rule on October 7, 2002 at 67 FR 62618 granting a National Treatment Variance for radioactively contaminated cadmium, mercury, and silver contaminated batteries. The rule creates new Land Disposal Restriction subcategories for these wastes. The treatment standard for the wastes in the new subcategory is macroencapsulation in accordance with hazardous debris provisions. The effective date of this rule was November 21, 2002. Because the rule is less stringent than current Colorado Hazardous Waste Act requirements, the State of Colorado must adopt the regulation prior to the regulation being implemented at RFETS. The Site is monitoring the State of Colorado regulatory activities related to this rule.

EPA issued the *Final Guidance on Completion of Corrective Action Activities at RCRA Facilities* on February 13, 2003 (Published on February 25, 2003 at 68 FR 8757). The memorandum provides guidance on significant issues related to completion of corrective action activities at RCRA facilities and discusses completion determinations for less than an entire facility.

The 2002 RFCA Annual Review Report stated that EPA issued a final rule on October 3, 2001 at 66 FR 50332 entitled, *Correction to the Hazardous Waste Identification Rule: Revisions to the Mixture and Derived-from Rules; Direct Final Rule*. The Colorado Hazardous Waste Commission adopted the rule on June 17, 2003; it will be effective on August 30, 2003.

## **2.3 Toxic Substances Control Act**

No new rules, regulations, written policies or guidance were identified within the review period.

## **2.4 Clean Water Act, Colorado Water Quality Control Act, and Safe Drinking Water Act**

There were several actions taken under authority of the Clean Water Act in the period July 1, 2002 through June 30, 2003, some of which impact RFETS, either immediately or in the long term. However, based upon a review of the following rulemaking actions, no amendment of RFCA is proposed.

### **2.4.1 Clean Water Act**

#### **Definition of Waters of the United States**

As a result of the *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers*, 531 U.S. 159 (2001) (SWANCC) decision, EPA and the Army Corps of Engineers published an Advanced Notice of Proposed Rulemaking seeking comment on how to change the definition of waters of the United States to comply with the court ruling. EPA reported that the agency had received over 150,000 written comments on the proposed rule. There was no final agency action by June 30, 2003. Changes in the definition of waters of the U.S. may have an impact on certain

areas at RFETS, but any substantive regulatory change will not likely be effective before plant closure.

#### **Phase II Storm Water Regulations**

In March 2003, Phase II storm water regulations became effective, requiring small municipalities to obtain storm water permits. The new regulations also reduced the size of construction sites subject to storm water permit requirements from 5 acres to 1 acre. Since the Site already has a Phase I storm water permit, the new regulations have no immediate impact.

#### **2.4.2 Colorado Water Quality Control Act**

##### **Site Specific Water Quality Standards**

In November 2002, the Water Quality Control Commission initiated the triennial review process for the South Platte basin. While the actual triennial review is scheduled for July 2004, the Commission process now includes plenary hearings in the two years preceding the rulemaking hearing. Issues identified in the first step in this process included the appropriate averaging period for radionuclide monitoring. The Commission was requested by CDPHE to adopt an annual averaging period for plutonium and americium at the Points of Compliance at the outfalls of Ponds A-4, B-5 and C-2 using the Site's moving average methodology, as provided in Section 2.2.C.4 of RFCA Attachment 5. The second scoping hearing is scheduled for October 2003.

##### **Colorado Water Quality Control Act Section 309**

During the 2001-2002 Colorado legislative session, Section 309 was added to the Colorado Water Quality Control Act. In addition to authorizing permit fee increases, Section 309 also required the Department of Public Health and Environment to conduct a broad review of the water quality control program, including the appropriateness of water quality standards and to consider the unique characteristics of Colorado waters. A report is due to the state legislature at the end of 2003. In the past year, the Water Quality Control Division has convened monthly meetings to gather input from stakeholders on all aspects of the water quality program. One significant area of interest is effluent dominated streams, such as occurs on RFETS. The work group is considering expanding use classifications to recognize the unique characteristics of such streams.

#### **2.4.3 Safe Drinking Water Act**

No new or revised Maximum Contaminant Levels were adopted since the last update or any other changes to the Safe Drinking Water Act that would apply to RFETS activities.

## 2.5 Clean Air Act

EPA and the State of Colorado continued to promulgate regulations under the existing Act, but the majority is not applicable to RFETS activities. Where new regulations were applicable there were no new compliance requirements.

### Colorado Air Quality Control Commission (CAQCC) Regulation No. 3

The CAQCC revised the "Air Contaminant Emissions Notices" regulations on July 18, 2002. The provisions concerning nonroad engines have changed substantially. The prior regulation exempted certain nonroad engines from Air Pollutant Emission Notice (APEN) and permitting requirements (fuel-fired generators, pumps, and compressors). To reconcile air quality concerns with these nonroad engines, the State has created a new state-only nonroad engine program for certain nonroad engines. An APEN must be filed for a nonroad engine if a trigger level will be exceeded (based on hours of operation). While these changes are significant, RFETS already has a program in place to identify and track these engines.

Coordinated provisions were made to the Common Provisions in July 2002, and to Regulation No. 3 in July and October 2002, and in March 2003. The comprehensive revisions removed duplicate definitions and moved definitions to the more appropriate of the two regulations. Many definitions and exemptions from Air Pollutant Emission Notices (APENs) and/or permits were revised. Obsolete provisions were removed from both regulations. Format, style, and language changes were made to address ambiguities. Provisions governing nonroad engines (which are important to RFETS) were revised fairly significantly. Recordkeeping requirements were added to a number of types of APEN exemptions. While these changes will not impact RFCA, it is important that the Site use the updated version of the regulations when determining applicable requirements for projects and activities.

### Redesignation for PM<sub>10</sub>

In September 2002, the Denver area was redesignated to maintenance for PM<sub>10</sub>. Because of this, the major source permit requirements in the Denver area reverted to the prevention of significant deterioration program, rather than the nonattainment program. Because of this change, the Site is no longer a major source with respect to preconstruction permit requirements, but remains a major source under the operating permits program.

### CAQCC Regulation No. 8 Part A, Subpart H (40 CFR 61, Subpart H)

EPA revised the radionuclide National Emissions Standards for Hazardous Air Pollutants in September 2002. These revisions were incorporated into the State regulations. The regulation

adopted the revised ANSI standard for monitoring equipment (shrouded probe). The Site is contending, and the State and EPA have verbally agreed, that this requirement does not apply to existing RFETS monitors due to the environmental monitoring agreement with the State and EPA, "Proposal to Use Environmental Sampling for Demonstrating Compliance with 40 CFR 61, Subpart H", dated July 1997, and the 1998 Addendum. However, any new effluent monitoring will have to meet the new standard. In addition, the revisions added an inspection and maintenance program for effluent monitors.

EPA revised the "Control of Hazardous Air Pollutants" regulations on September 9, 2002 at 67 FR 57159. The revisions incorporated ANSI 13.1-1999 by reference, making shrouded-probe sampling systems mandatory for significant new or modified effluent release points. The revisions also add new Inspection and Maintenance requirements for all sampling systems (new and existing). The revisions are anticipated to have minimal impact on the Site, if adopted by the State of Colorado. RFETS has already upgraded existing sampling systems to include shrouded probes and has agreed to install shrouded probe systems in any new significant source of radionuclide emissions. DOE is reviewing with CDPHE whether the new Inspection and Maintenance requirements will apply to existing effluent sampling systems at RFETS since these systems are no longer used to demonstrate compliance with the radionuclide National Emission Standards for Hazardous Air Pollutants standard. This could have an impact on the Integrated Monitoring Plan, which implements RFCA compliance for all monitoring systems.

#### **CAQCC Regulation No. 8 Part B (Asbestos)**

Regulation No. 8 Part B, was revised in March 2003. The regulation was reorganized. Certain definitions were changed and a requirement for air monitoring specialists to be certified was added. Some of these changes will apply to asbestos abatement activities at RFETS.

#### **2.6 National Environmental Policy Act**

No new rules, regulations, written policies or guidance were identified within the review period. No separate National Environmental Policy Act reviews have been required or performed under RFCA pursuant to RFCA paragraph 95.

#### **2.7 Endangered Species Act**

On July 17, 2002, the Department of Interior Fish and Wildlife Service issued a proposed rule (67 FR 47154) that would designate critical habitat for the Preble's Meadow Jumping Mouse, including the three major drainages at RFETS, pursuant to the Endangered Species Act of 1973, as amended. On June 23, 2003, the Department of Interior Fish and Wildlife Service issued a final rule (68 FR 37276) that excluded RFETS from designation as a critical habitat.

## 2.8 Migratory Bird Treaty Act

On April 15, 2003, the Department of Interior Fish and Wildlife Service issued a memorandum (MBPM-2) clarifying the application of the Migratory Bird Treaty Act to migratory bird nest destruction. The memorandum states that a permit is not required for the destruction of inactive nests that do involve taking possession of the nest. Currently, the Site holds a Migratory Bird Treaty Act permit that includes annually reporting on the number of inactive nests removed. The Site does not plan on renewing the permit in calendar year 2004 based on this memorandum.

## 2.9 Radiation Related Document Review

See, Section 3.0 Radionuclide Soil Action Levels, below.

## 2.10 Environmental Statute Summary

Based on the review of the environmental statutes and associated regulations, written policy, and guidance, no amendment to RFCA is required at this time.

## 3.0 RADIONUCLIDE SOIL ACTION LEVELS

The RFCA Parties completed their review of the RSALs and the RSAL working group documented the review in, *Results of the Interagency Review of Radionuclide Soil Action Levels*, September 30, 2002, which is online at [www.rfets.gov](http://www.rfets.gov).

The RFCA Parties completed their review of the RSALs during the review period and proposed that RFCA Attachment 5, *Action Levels and Standards Framework for Surface Water, Ground Water, and Soils*, be modified to reflect the new RSALs. The RFCA Parties identified additional changes to RFCA Attachment 5, as well as RFCA Attachment 10, *RCRA Closure for Interim Status Units*. On November 12, 2002, the RFCA Parties released proposed modifications to RFCA Attachments and a new Attachment for public review and comment. The November 12, 2002 release consisted of a *Technical Basis Document for the Proposed Modifications* and the following Public Review Draft versions of the proposed modifications:

- RFCA Attachment 5, Action Levels and Standards Framework for Surface Water, Ground Water, and Soils;
- RFCA Attachment 10, RCRA Closure for Interim Status Units; and
- A new RFCA Attachment 14, Original Process Waste Lines (OPWL) Subsurface Soil Approach.

During the public comment period, on December 17, 2002, the RFCA Parties held a public meeting to discuss the proposed modifications and to accept public comments provided at that meeting. Ninety-five sets of individual or organization comments were received. After consideration of the public comments received and incorporation of changes deemed necessary for approval, EPA and CDPHE approved the final modifications on June 5, 2003.

In addition to the annual review requirements prescribed in RFCA paragraph 5, the RFCA Parties also addressed the four questions discussed in the introduction. The RSAL working group reviewed questions 1 and 2 as part of its review.

Regarding question 3, the following accelerated actions applied the interim RSALs, 50 pCi/g (the interim RSALs out for public comments) during the review period:

Building 663 cleanup levels were based on the then proposed plutonium action level of 50 pCi/g. Subsurface contamination was found at one location directly beneath a crack in the slab that apparently allowed contaminated liquids to flow into the subsurface soils. Soil contamination was removed from an area 2 feet wide, 8 feet long and 4.5 feet deep. The width of the excavation was a result of the size of the excavator bucket; the actual contaminated area was much narrower. When the excavation was complete, the plutonium activity at the bottom of the excavation was 17 pCi/g. The consultative process was used to determine when the remedial action was completed.

The 903 Pad project uses the final RFCA action levels for plutonium (50 pCi/g). Excavation depth per cell depends on the plutonium activity at each cell. As described in the ER RSOP Notification for this project, after removal of the first foot of native soils, a samples are collected. Based on these results and the depth of excavation, a decision is made on whether the excavation is complete or if more soil will be excavated. As of July 16, 2003 the maximum depth excavated was 8 feet deep below the asphalt at one 4 foot by 4 foot excavation. The size and depth of the area was negotiated with the regulators and documented on a contact record.

1. Solar Ponds project cleaned up a few small hot spots contaminated with americium 241 only. The cleanup level for americium decided upon with the regulators was 35 pCi/g. Chromium present with the americium was also cleaned up to below Tier II levels, however, the cleanup was driven by the americium. Depth was generally 6 inches to one foot, but one hot spot was remediated to a depth of between two to three feet.

Finally, regarding question 4, the first CERCLA 5 Year Review for the Site was conducted during the previous review period. On September 26, 2002 EPA concurred with the conclusions and recommendations presented in the 5 Year Review. The Review concluded that the remedies implemented for OU-1 and OU-3 are protective and that ongoing custody and control of the Site



by DOE, monitoring programs and restrictions of public access to the Site serve to adequately control risks posed by contamination, including radionuclides, at this time.

#### **4.0 RFCA ATTACHMENT 5: ACTION LEVELS AND STANDARDS FRAMEWORK FOR SURFACE WATER, GROUND WATER AND SOILS**

The RFCA Parties identified changes to RFCA Attachment 5 in addition to the proposed RSALs. Proposed modifications to Attachment 5 were available for public comment in accordance with RFCA paragraph 117 from November 12, 2002 through January 31, 2003. A public meeting was held on December 17, 2002. EPA and CDPHE approved the final modifications on June 5, 2003. See Section 3.0 above details.

##### **Practical Quantification Limits (PQLs)**

The Site's Analytical Services Division has evaluated the changes to the RFCA Attachment 5, Table 1 Surface Water Action Levels and Standards for commercial analytical capability and have determined that several of the changes are either technically not feasible, will force laboratories to use multiple methods for a single analytical suite, or employ special concentration steps. These options are not cost effective for the laboratories and may result in the Laboratory's refusal to accept RFETS samples. The Site's Analytical Services Division identified and proposed changes to some of the PQLs listed in RFCA Attachment 5, Table 1. Proposed PQLs are in Appendix 1 to this Report. If the RFCA Parties determine that changes to the PQLs are necessary, then the proposed PQLs will be available for public review and comment in accordance with RFCA paragraph 117.

#### **5.0 PRELIMINARY REMEDIATION GOALS**

The RFCA Parties updated the risk-based PRGs (formerly known as Preliminary Programmatic Remediation Goals or PPRGs) in 2002, including a new receptor, the wildlife refuge worker. The new receptor was deemed appropriate based upon the Rocky Flats National Wildlife Refuge Act of 2001, designating RFETS as a future National Wildlife Refuge. The exposure pathways; methodology, equations, and assumptions; and chemical toxicity information for both human and ecological receptors can be found in RFCA Appendix 3 IGD, Appendix N, Preliminary Remediation Goals.

#### **6.0 IMPLEMENTATION GUIDANCE DOCUMENT**

RFCA Appendix 3, IGD was reviewed by the RFCA Parties to determine if an update was necessary. Appendix K, Master List of Potential ARARs, had one comment updated to reflect a change identified for 40 CFR 761.62 during the 2002 Annual Review. Appendix M, Action

Levels for Radionuclides in Soils was deleted. Information on Action Levels for Radionuclides in Soils can now be found in *Results of the Interagency Review of Radionuclide Soil Action Levels*, September 30, 2002, which is online at [www.rfets.gov](http://www.rfets.gov). Appendix N, Preliminary Remediation Goals, was updated to include the wildlife refuge worker exposure scenario and the latest chemical toxicity information. Copies of the updated Appendices to the IGD are included as Appendix 2 to this Report.

## **APPENDIX 2**

### **UPDATES TO RFCA APPENDIX 3, IGD, APPENDICES K, M AND N**

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Requirement	Citation	Type	Comment
<b>ATOMIC ENERGY ACT (AEA) [42 USC 2200 et. seq.]</b>			
<b>CHRONIC BERYLLIUM DISEASE PREVENTION PROGRAM</b>	10 CFR 850	A	Establishes a program to reduce the number of worker currently exposed to beryllium in the course of their work at DOE facilities. The cited sections are followed in relation to determinations of beryllium contamination and release to the public.
<ul style="list-style-type: none"> <li>Definitions</li> <li>Release criteria</li> <li>Waste disposal</li> <li>Warning labels</li> </ul>	.3 .31 .32 .38 (b-c)		

<b>RADIATION CONTROL</b>			
Emergency Plan -- required if material quantity exceeds Schedule E of Part 3 (e.g., 2 curies of alpha emitters) and evaluation shows maximum dose to offsite person from release exceeds 1 rem (5 rem to thyroid).	RH 3.9.11	A/L	DOE maintains its Emergency Plan in accordance with DOE Order 151.1, "Comprehensive Emergency Management System"
Decommissioning Plan Contents -- must include a description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning.	RH 3.16.4.3.3	A	Planned implementation of Site approved procedures to meet 10 CFR 835, "Occupational Radiation Protection" and the Site's IWCP process will be described for proposed actions.
Decommissioning Plan Contents -- must include a description of the planned final radiation survey.	RH 3.16.4.3.4	A/L	Planned implementation of the Decommissioning Characterization Protocols or any final sampling and analysis plan for environmental media will be described.
Decommissioning Plan Contents -- must include a description of the intended final condition of the site, buildings and/or outdoor areas upon decommissioning.	RH 3.16.4.3.6	A/L	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include analysis demonstrating that reductions in residual radioactivity necessary to comply with the provisions of RH 4.61.2 (unrestricted access) would result in net public or environmental harm or were not being made because residual levels of contamination associated with restricted conditions are ALARA, taking into account consideration of any detriments expected to potentially result from decontamination and waste disposal.	RH 3.16.4.3.7.1	A/L	The analysis will be part of any accelerated action or final action regulatory decision document for environmental media cleanup projects proposing restricted access.
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include a description of the institutional controls necessary to satisfy RH 4.61.3.2 (described below), including a description of how the controls will be enforced.	RH 3.16.4.3.7.2	A/L	The description will be required for any final action regulatory decision document for environmental media cleanup projects proposing restricted access.
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include an analysis demonstrating that if institutional controls were no longer in effect, the dose criteria of RH 4.61.3.3 (described below) will be met.	RH 3.16.4.3.7.3	A/L	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

## **APPENDIX 2**

### **UPDATES TO RFCA APPENDIX 3, IGD, APPENDICES K, M AND N**

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Requirement	Citation	Type	Comment
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<b>ATOMIC ENERGY ACT (AEA) [42 USC 2200 et. seq.]</b>			
<b>CHRONIC BERYLLIUM DISEASE PREVENTION PROGRAM</b>	10 CFR 850	A	Establishes a program to reduce the number of worker currently exposed to beryllium in the course of their work at DOE facilities. The cited sections are followed in relation to determinations of beryllium contamination and release to the public.
<ul style="list-style-type: none"> <li>Definitions</li> <li>Release criteria</li> <li>Waste disposal</li> <li>Warning labels</li> </ul>	.3 .31 .32 .38 (b-c)		

<b>RADIATION CONTROL</b>			
Emergency Plan - required if material quantity exceeds Schedule E of Part 3 (e.g., 2 curies of alpha emitters) and evaluation shows maximum dose to offsite person from release exceeds 1 rem (5 rem to thyroid).	RH 3.9.11	A/L	DOE maintains its Emergency Plan in accordance with DOE Order 151.1, "Comprehensive Emergency Management System"
Decommissioning Plan Contents - must include a description of methods used to ensure protection of workers and the environment against radiation hazards during decommissioning.	RH 3.16.4.3.3	A	Planned implementation of Site approved procedures to meet 10 CFR 835, "Occupational Radiation Protection" and the Site's IWCP process will be described for proposed actions.
Decommissioning Plan Contents - must include a description of the planned final radiation survey.	RH 3.16.4.3.4	A/L	Planned implementation of the Decommissioning Characterization Protocols or any final sampling and analysis plan for environmental media will be described.
Decommissioning Plan Contents - must include a description of the intended final condition of the site, buildings and/or outdoor areas upon decommissioning.	RH 3.16.4.3.6	A/L	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include analysis demonstrating that reductions in residual radioactivity necessary to comply with the provisions of RH 4.61.2 (unrestricted access) would result in net public or environmental harm or were not being made because residual levels of contamination associated with restricted conditions are ALARA, taking into account consideration of any detriments expected to potentially result from decontamination and waste disposal.	RH 3.16.4.3.7.1	A/L	The analysis will be part of any accelerated action or final action regulatory decision document for environmental media cleanup projects proposing restricted access.
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include a description of the institutional controls necessary to satisfy RH 4.61.3.2 (described below), including a description of how the controls will be enforced.	RH 3.16.4.3.7.2	A/L	The description will be required for any final action regulatory decision document for environmental media cleanup projects proposing restricted access.
Decommissioning Plan Contents – if proposing to use the criteria in RH 4.61.3 or RH 4.61.4 (restricted access), the plan must include an analysis demonstrating that if institutional controls were no longer in effect, the dose criteria of RH 4.61.3.3 (described below) will be met.	RH 3.16.4.3.7.3	A/L	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered



Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Decommissioning Plan will be approved by CDPHE if information therein meets RH 3.16, and RH 4.61, decommissioning is completed as soon as practicable, and health and safety of the public is adequately protected.	RH 3.16.4.6	A/L	This section also specifies requirements for a long term care warranty under RH 3.9.5.10 that may be required if using the criteria in RH 4.61.3 or RH 4.61.4 (restricted access). The RFCA Parties agree that further analysis is required to determine whether long term care warranty requirements are relevant and appropriate to Rocky Flats. Planned implementation of Site approved procedures to meet DOE Order 5400.5, "Radiation Protection of the Public and the Environment" and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions. The Closure Project Baseline is focused on achieving decommissioning as soon as practicable.
Site radiation survey to establish residual contamination levels and/or confirm absence of contamination. As appropriate, survey building/outdoor areas that contain residual radioactivity.	RH 3.16.6.2	A/L	Requirements for radiation surveys are met through the Reconnaissance Level Characterization Survey Plans and Predemolition Survey Plans for facility decommissioning and through Sampling and Analysis Plans and the Integrated Monitoring Plan for Environmental Restoration.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Submittal of final survey report, units and other information - specifies, as appropriate, that gamma levels be reported at 1 meter from surface in <i>microrem/hr</i> , removable and fixed contamination in DPM/100 cm <sup>2</sup> , and radioactive concentrations in pCi/L or per gram; identify instruments used and certify proper calibration/testing.	RH 3.16.6.3	A/L	Same as RH 3.16.6.2 above
Criteria for license termination based on CDPHE determination that (1) radioactive materials have been properly disposed; (2) licensee has demonstrated that regulatory requirements for termination have been met; (3) the licensee has established a long-term care warranty; if required; and (4) institutional controls have been implemented to limit public doses, if required.	RH 3.16.7	A/L	Although license termination is not relevant to Rocky Flats, CDPHE believes the substantive criteria in this regulation are relevant and appropriate to determining the end point for decommissioning at Rocky Flats. Subsection (1) is met through compliance with the "offsite rule", 40 CFR 300.440; and subsections (2) and (4) are addressed in RH 4.61.2 through .4 (discussed below). Subsection (3), which is grounded in RH 3.9.5.10, is discussed above under RH 3.16.4.6.
Additional cleanup can be required if, based on new or previously unknown information, CDPHE finds that criteria in RH 4.61 not met and residual radioactivity remaining at site could result in significant threat to public health and safety.	RH 3.16.8	L	This standard is generally consistent with the "imminent and substantial endangerment" standard under CERCLA. Present risk of future harm (e.g., a risk of cancer due to long-term exposure) can be an "imminent" threat.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
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<b>RADIATION CONTROL</b>			
Radiation Protection Program - To extent practicable, procedures and controls used shall be based on sound radiation protection principles to achieve public doses that are ALARA.	RH 4.5.2	A	Planned implementation of Site approved procedures to meet 10 CFR 835, "Occupational Radiation Protection", DOE Order 5400.5, "Radiation Protection of the Public and the Environment" and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions.
Radiation Protection Program - Imposes constraint on air emissions of radioactive material to the environment. "Individual member of the public likely to receive the highest dose" will not be expected to receive a TEDE greater than 10 mrem/yr from air emissions. Requires exceedance reporting and corrective action to ensure against recurrence.	RH 4.5.4	A	Listed only for completeness of this table. NESHAPS already identified as ARAR. Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public.
Dose limits for individual members of the public - TEDE from licensed operations less than 100 mrem/yr above background, exclusive of medical exposure and exposure from disposal by sanitary sewer. Dose rate in unrestricted areas less than 2 mrem/hr.	RH 4.14.1	A/L	Site approved procedures to meet DOE Order 5400.5, "Radiation Protection of the Public and the Environment" are based on the same dose rate limits.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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#### RADIATION CONTROL

Dose Limits for Individual Members of Public – Surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas shall be made to demonstrate compliance with the dose limits for individual members of the public in RH 4.14.	RH 4.15.1	A/L	Surveys are conducted pursuant to site approved procedures to meet DOE Order 5400.5, "Radiation Protection of the Public and the Environment". Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public. Surface water is monitored in accordance with the Integrated Monitoring Plan and RFCA Attachment 5.
Dose Limits for Individual Members of Public – Provides the means to demonstrate compliance with RH 4.14: by measurement or calculation that dose does not exceed the annual limit or by demonstrating that annual average radioactive material concentration released in gaseous and liquid effluents at boundary of the unrestricted area does not exceed Appendix B, Table II, "Effluent Concentrations".	RH 4.15.2.1 and .2	L	Site approved procedures to meet DOE Order 5400.5, "Radiation Protection of the Public and the Environment" are based on the same dose rate limits. Radionuclide NESHAPS required monitoring established at site perimeter is used to determine potential for exposure to individual member of the public. Surface water is monitored in accordance with the Integrated Monitoring Plan and RFCA Attachment 5.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
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<b>RADIATION CONTROL</b>			
Surveys shall be made as necessary to evaluate radiation levels, concentrations of radioactive material and potential radiological hazards that could be present.	RH 4.17.1	A/L	Planned implementation of Site approved procedures to meet 10 CFR 835, "Occupational Radiation Protection", DOE Order 5400.5, "Radiation Protection of the Public and the Environment" and the Site's IWCP process, which includes Lead Regulatory Agency involvement, will be described for proposed actions. Requirements for radiation surveys are met through the Reconnaissance Level Characterization Survey Plans and Predemolition Survey Plans for facility decommissioning and through Sampling and Analysis Plans and the Integrated Monitoring Plan for Environmental Restoration.
Instruments and equipment used for qualitative radiation measurements must be calibrated at intervals NTE 12 months, unless otherwise noted by regulation.	RH 4.17.2	A	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Waste Disposal – Shall dispose only by transfer to authorized recipient, by release in effluents within the limits of subpart RH 4.14 (discussed above), or as authorized pursuant to (pertinent to RFETS) RH 4.34, "Method for Obtaining Approval of Proposed Disposal Procedures", or RH 4.35, "Disposal by Release into Sanitary Sewerage".	RH 4.33	A/L	Transfer to authorized recipient is met through compliance with the "offsite rule", 40 CFR 300.440. Proposals for onsite disposal of radioactive waste (if any) will be part of any accelerated action, or any final action regulatory decision document for environmental media cleanup projects proposing specific disposal methods. RH Part 11, "Special Land Ownership Requirements" which addresses requirements if government ownership of RFETS is transferred to private ownership, and RH Part 14, "Licensing Requirements for Land Disposal of Low Level Radioactive Waste" will be reviewed for relevant and appropriate requirements for cleanup projects proposing specific disposal methods.
Disposal by Release to Sanitary Sewer – Material must be "readily soluble" in water, monthly average concentrations below Appendix B, Table III, "Concentrations for Release to sanitary Sewerage". Total less than 1 curie/year.	RH 4.35	A	Site approved procedures to meet DOE Order 5400.5, "Radiation Protection of the Public and the Environment" are based on the same concentration limits. Required radionuclide monitoring for the discharge of the RFETS Sewage treatment Plant is established in the Rocky Flats NPDES Permit. Surface water is also monitored in accordance with the Integrated Monitoring Plan and RFCA Attachment 5.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Permissible levels of plutonium in uncontrolled areas – Soil concentration greater than 2 DPM per gram or per cm <sup>3</sup> presents sufficient hazard to the public health that requires use of special construction techniques.	RH 4.60	A/L	All of RFETS is a controlled area as defined in 10 CFR 20.1003 ("controlled area", outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason) and RH 1.4 ("uncontrolled area" means area, access to which is neither limited nor controlled by the licensee). These terms are also consistent with 10 CFR 835.2. DOE does not anticipate any construction in uncontrolled areas to decommission RFETS.
Radiological Criteria for License Termination (i.e., for Decommissioning) – Must calculate maximum TEDE to "average member of the critical group" within the first 1000 years after decommissioning.  NOTE: Decommissioning criteria in section RH 4.61 do not apply to waste disposal cells.	RH 4.61.1.2	A/L	Although license termination is not relevant to Rocky Flats, CDPHE believes the substantive criteria in this regulation are relevant and appropriate standards for decommissioning Rocky Flats. See the RSAL Regulatory Analysis for the RFCA Parties understandings regarding Implementation of the "Decommissioning Rule".
Radiological Criteria (for Decommissioning) – Determination of dose and residual activity levels which are ALARA, must take into account consideration of any detriments expected to potentially result from decontamination and waste disposal.	RH 4.61.1.3	A/L	The analysis will be part of any accelerated action for environmental media cleanup projects and any final action regulatory decision document.

Requirement	Citation	Type	Comment
<b>RADIATION CONTROL</b>			
Criteria for Unrestricted Use - Residual radioactivity above background has been reduced to levels that are ALARA and results in TEDE to average member of the critical group that does not exceed 25 mrem/yr., including groundwater sources of drinking water.	RH 4.61.2	A/L	The analysis will be part of any accelerated action for environmental media cleanup projects and any final action regulatory decision document.
Criteria for Restricted Use - Must demonstrate that further residual radioactivity reductions to meet Unrestricted Use:  1) would result in net public or environmental harm OR 2) are not being made because residual levels are ALARA.	RH 4.61.3.1	A/L	
Criteria for Restricted Use -  1) Provisions made for durable, legally enforceable institutional controls that provide reasonable assurance that TEDE to average member of the critical group will not exceed 25 mrem/yr. AND 2) If Institutional Controls were no longer in effect, TEDE above background is ALARA and would not exceed either: 100 mrem/yr. OR 500 mrem/yr., if demonstrated that further reductions are not technically achievable, would be prohibitively expensive or would result in net public or environmental harm.	RH 4.61.3.2 and .3	A/L	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered



Requirement	Citation	Type	Comment
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#### RADIATION CONTROL

##### Alternate (Decommissioning) Criteria -

- 1) Analysis provides assurance that public health and safety would continue to be protected and unlikely TEDE would be more than 100 mrem/yr.
- 2) Employment of restrictions on site use that minimize exposures at the site.
- 3) Doses are reduced to ALARA.

RH 4.61.4.1.1 through .3

A/L

#### CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]

##### NATIONAL AMBIENT AIR QUALITY STANDARDS (tc 12 "AMBIENT AIR QUALITY STANDARDS")

- Sulfur Dioxide
- Particulate Matter (PM10 & PM2.5)
- Carbon Monoxide
- Ozone
- Nitrogen Dioxide
- Lead

5 CCR 1001-14  
[40 CFR 50]

C

National Ambient Air Quality Standards (NAAQS) define levels of air quality which are deemed necessary, with an adequate margin of safety, to protect the public health. The standards are the basis for air quality regulations that are designed to improve and protect air quality. The Denver metro area exceeds the standard for particulate matter and carbon monoxide (i.e. non-attainment for those pollutants).

Ambient air quality standards are not effluent discharge limitations; they are used in conjunction with air dispersion modeling to establish emission limits that are protective of air quality. Air Quality Management personnel will review projects for Prevention of Significant Deterioration and Non-attainment Area permitting requirements, and perform modeling, if requested by CDPHE, to demonstrate compliance with the NAAQS.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]</b>			
- Construction Permits, Including Regulations for the Prevention of Significant Deterioration (PSD)	Part B	C	Construction permits are not required for CERCLA activities, however, substantive requirements that would normally be associated with construction permits will apply. Also, fuel-fired equipment (generators, compressors, etc.) associated with these activities may require permitting.
- Construction Permits	Part B, Section III		
- Non-attainment Area Requirements	Section IV.D.2		
- Prevention of Significant Deterioration Requirements	Section IV.D.3	A, C, L	Even though CERCLA activities are exempt from construction permit requirements, PSD requirements may apply if emissions of certain pollutants exceed certain threshold limits. The requirements include emissions reductions or offsets, and strict emission control requirements.
		A, C, L	Even though CERCLA activities are exempt from construction permit requirements, PSD requirements may apply if emissions of certain pollutants exceed certain threshold limits. The requirements include strict emission control requirements, source impact modeling, and pre-construction and post-construction monitoring.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]</b>			
<ul style="list-style-type: none"> <li>Standards of Performance for New Stationary Sources</li> </ul>	CAQCC Reg. No. 6 [5 CCR 1001-8]	A	New Source Performance Standards exist for various types of stationary sources. Currently, no standards exist for demolition activities. A standard exists for organic liquid storage vessels greater than 10,000 gallons (40 CFR 60, Subpart Kb). This standard will apply to closure activities utilizing this type of storage vessel.
<ul style="list-style-type: none"> <li>Emissions of Volatile Organic Compounds (VOCs)               <ul style="list-style-type: none"> <li>General Requirements for Storage and Transfer of VOCs</li> <li>Disposal of VOCs</li> <li>Storage and Transfer of Petroleum Liquid</li> </ul> </li> </ul>	CAQCC Reg. No. 7 [5 CCR 1001-9]  Section III.B  Section V  Section VI	A  A  A	This requirement applies to the transfer of organic liquids to a tank larger than 56 gallons (bottom fill or submerged fill must be utilized).  This requirement prohibits the disposal of VOCs by evaporation and spillage.  This requirement regulates storage and transfer of petroleum liquids.
<ul style="list-style-type: none"> <li>Control of Hazardous Air Pollutants               <ul style="list-style-type: none"> <li>Part A, Subpart A, General Provisions (CAQCC regulation incorporates CFR by reference)</li> </ul> </li> </ul>	CAQCC Reg. No. 8 [5 CCR 1001-10]  40 CFR Part 61, Subpart A	C	This subpart details the general provisions that apply to sources subject to National Emission Standards for Hazardous Air Pollutants (NESHAPs). The provisions will apply to any D&D project that is subject to a

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]</b>			
- Part A, Subpart C, National Emission Standard for Beryllium (CAQCC regulation incorporates CFR by reference)	40 CFR Part 61, Subpart C	C	NESHAP. This subpart details the regulatory requirements for emissions of beryllium from specific stationary source categories, such as machine shops or incinerators that process/machine beryllium. The requirements may apply to any D&D project that includes size reduction of beryllium containing materials.
- Part B, The Control of Asbestos	Section II	C	This requirement will apply if the project includes asbestos abatement. Compliance requires that asbestos inspectors, asbestos abatement workers, and asbestos abatement project managers are certified in accordance with the regulation.
	Section III	C	This section details project requirements including notification, permitting, and asbestos abatement work practices.
	Section III.B.1.a.(i)	C	A written notice of the intent to conduct demolition (regardless of whether asbestos is involved) or asbestos abatement must be submitted to the CDPHE, Air Pollution Control Division at least 10 working days before commencing demolition or an abatement project (form supplied by the CDPHE). This notification should be submitted within the decision document or as a modification to the approved decision document.
- Part C, Lead	Section I	C	This requirement applies if the project produces lead emissions (glovebox size reduction, etc.). Compliance requires utilizing a suitable dispersion model to ensure that emissions of lead will not result in an ambient lead

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]</b>			
<ul style="list-style-type: none"> <li>Control of Emissions of Ozone-Depleting Compounds</li> </ul>	CAQCC Reg. No. 15 [5 CCR 1001-19]	C	<p>concentration that exceeds 1.5 micrograms per cubic meter averaged over a one-month period.</p> <p>This requirement applies if any refrigeration system or appliance that contains a regulated ozone-depleting compound (ODC) is disassembled or discarded. Compliance requirements include having registered and certified technicians recover all regulated ODCs in an approved vessel, by an approved method, prior to disassembly or disposal.</p>
<p><b>NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS</b>{tc \12 "NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS}</p> <ul style="list-style-type: none"> <li>National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities             <ul style="list-style-type: none"> <li>Standard</li> </ul> </li> </ul>	<p>40 CFR 61, Subpart H</p> <p>61.92</p>	C, L	<p>This section establishes a radionuclide emission standard equal to those emissions that yield an effective dose equivalent (EDE) of 10 mrem/year to any member of the public. The Site complies by using stack effluent discharge data and empirically estimated fugitive emissions in the dose model CAP88-PC for calculating the EDE to the most impacted member of the public to ensure that it does not exceed 10 mrem/year. Also, the perimeter samplers in the Radioactive Ambient Air Monitoring Program sampler network are utilized to verify compliance with the standard.</p>

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
<b>CLEAN AIR ACT (CAA) [42 USC 7401 et. seq.]</b>			
- Emission Monitoring and Test Procedures	61.93	C, A	This section establishes emission monitoring and testing protocols required to measure radionuclide emissions and calculate EDEs. This section also requires that radionuclide emissions measurements (stack monitoring) be made at all release points which have a potential to discharge radionuclides into the air which could cause an EDE to the most impacted member of the public in excess of 1% of the standard (0.1 millirem/year).
- Compliance and Reporting	61.96	C, L	This section requires the Site to perform radionuclide air emission assessments of all new and modified sources. For sources that exceed the 0.1 mrem/year EDE threshold (controlled), the appropriate applications for approval must be submitted to the EPA and the CDPHE. Additional substantive requirements may apply if the activity requires approval.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
FEDERAL WATER POLLUTION CONTROL ACT [33 USC 1251 et. seq.]  WATER QUALITY CRITERIA - GOLD BOOK (ic 112 "QUALITY CRITERIA - GOLD BOOK")	33 USC 1314 (CWA Section 304)	C	<p>The "Gold Book" presents guidelines with respect to water quality criteria for toxic pollutants. Criteria are published for aquatic and human health. The water quality criteria are not promulgated standards; however, they are established guidelines used for developing NPDES permits and may be considered potentially relevant and appropriate. WQC should not be used as effluent limits, rather discharge limits should be established either through the NPDES or UIC permitting process.</p> <p>Although water criteria are non-promulgated and non-enforceable standards, Section 121(d)(2)(B)(i) of CERCLA as implemented by the NCP (40 CFR 300.430(e)(2)(D)(B)) specifies that WQC established under Sections 303 and 304 of the CWA shall be attained where relevant and appropriate under the circumstances of the release. The designated or potential use of the surface or groundwater, the environmental media affected, the purpose for which the WQC were developed, and the latest information are to be considered in determining the relevance and appropriateness of the WQC to the response action. Therefore, the need to comply with WQC as a relevant and appropriate requirement needs to be determined on a case-by-case basis using the factors listed above.</p>



Requirement	Citation	Type	Comment
<b>FEDERAL WATER POLLUTION CONTROL ACT (aka Clean Water Act (CWA)) [33 USC 1251 et. seq.]</b>			
COLORADO BASIC STANDARDS AND METHODOLOGIES FOR SURFACE WATER	5 CCR 1002-31	C	Refer to RFCA Attachment 5 for surface water action levels and standards.
COLORADO BASIC STANDARDS FOR GROUNDWATER	5 CCR 1002-41	C	Refer to RFCA Attachment 5 for ground water action levels.
TOXIC POLLUTANT EFFLUENT STANDARDS • Toxic Pollutants • Compliance	40 CFR 129.4 40 CFR 129.5	C	If the permitted point is used, then the NPDES permit discharge standards would be met.
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM REGULATIONS • Designation of Hazardous Substances • Determination of Reportable Quantities for Hazardous Substances • Applicability of Best Management Practices • Best Management Practices Programs	40 CFR 116 40 CFR 117 40 CFR 125.102 40 CFR 125.104	A	These subparts are applicable to storage and use of products that contain toxic and hazardous pollutants above reportable quantity limitations, at a facility covered by an NPDES permit. In decision documents, identify and protect all connections to the sanitary collection system.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment
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FEDERAL WATER POLLUTION CONTROL ACT (aka Clean Water Act (CWA)) [33 USC 1251 et seq.]			
DISCHARGES OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES	33 USC 1344 33 CFR 323.3	L	
DOE COMPLIANCE WITH FLOODPLAIN/WETLANDS ENVIRONMENTAL REVIEW REQUIREMENTS	10 CFR 1022	AL	
<ul style="list-style-type: none"> <li>Floodplain/Wetlands Determination</li> <li>Floodplain/Wetlands Assessment</li> <li>Applicant Responsibilities</li> </ul>	.11 .12 .13		

NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS			
ENDANGERED SPECIES ACT (ESA) [16 USC 1531 et seq.]			
EARLY CONSULTATION	50 CFR 402.11	AL	Identify and minimize early in the planning stage of an action, any potential conflicts between the action and federally listed species.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered  
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Requirement	Citation	Type	Comment
<b>NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS</b>			
<b>ENDANGERED SPECIES ACT (ESA [16 USC 1531 et seq.]</b>			
<b>BIOLOGICAL ASSESSMENT (to V 3 "ASSESSMENT")</b> <ul style="list-style-type: none"> <li>• Purpose</li> <li>• Preparation Requirements</li> <li>• Request for Information</li> <li>• Director's Response <ul style="list-style-type: none"> <li>- No Listed Species or Critical Habitat Present</li> <li>- Listed Species or Critical Habitat Present</li> </ul> </li> <li>• Verification of Current Accuracy of Species List</li> <li>• Contents</li> <li>• Identical/Similar to Previous Action</li> <li>• Permit Requirements</li> <li>• Completion Time</li> <li>• Submission of Biological Assessment</li> <li>• Use of Biological Assessment</li> </ul>	50 CFR 402.12	A/L	This is the process DOE needs to follow to evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action and is used in determining whether formal consultation or a conference is necessary.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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Requirement	Citation	Type	Comment
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# NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS

## ENDANGERED SPECIES ACT (ESA [16 USC 1531 et seq.]

INTERAGENCY COOPERATION	• Informal Consultation	50 CFR 402	A/L	This is an optional process that includes all discussions, correspondence, etc. between the USFWS and the DOB. It is designed to assist in determining whether formal consultation or a conference is required. If during this step it is determined by the DOB with the written concurrence of the USFWS that the action is not likely to adversely affect listed species or critical habitat, the consultation process is terminated and no further action is necessary. DOB shall review its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat.
	• Formal Consultation			

MIGRATORY BIRD TREATY (16 USC 701-715)				
TAKING, POSSESSION, TRANSPORTATION, SALE, PURCHASE, BARTER, EXPORTATION, AND IMPORTATION OF WILDLIFE AND PLANTS	(16 USC 703), POSSESSION, TRANSPORTATION, SALE, PURCHASE, BARTER, EXPORTATION, AND IMPORTATION OF WILDLIFE AND PLANTS	50 CFR 10	A/L	Primarily focuses on the taking and possession of birds protected under this regulation. Enforcement is predicated on location of the project and time of the year. Current list of protected birds is kept with the Ecology group.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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# **NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS**

## **COLORADO NONGAME, ENDANGERED, OR THREATENED SPECIES CONSERVATION ACT [CRS 33-1-115, 33-2-101 to 33-2-107]**

<ul style="list-style-type: none"> <li>Compliance with the Colorado Nongame Wildlife including Endangered Species</li> </ul>	CRS 33-2-104 CRS 33-2-105	A/L	It is unlawful for any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common contract carrier to knowingly transport or receive for shipment any species or subspecies of wildlife appearing on the list of wildlife indigenous to the State of Colorado determined to be endangered within the state. (The list is continually updated by the Ecology group)
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## **FISH AND WILDLIFE COORDINATION ACT [16 USC 661 et seq.]**

<ul style="list-style-type: none"> <li>Purpose</li> <li>Impounding, Diverting, or Controlling of Waters</li> <li>Impoundment or Diversion of Waters</li> <li>Rules and Regulations</li> <li>Effects of Sewage and Industrial Waters</li> <li>Authorization of Appropriations</li> <li>Penalties</li> <li>Definitions</li> </ul>	16 USC 661 16 USC 662 16 USC 663 16 USC 664 16 USC 665 16 USC 666 16 USC 666(a) 16 USC 666(b)	A/L	
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A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS			
NATIONAL HISTORIC PRESERVATION ACT (NHPA [16 USC 470 et. seq.]			
IDENTIFYING HISTORIC PROPERTIES	<ul style="list-style-type: none"> <li>• Assessing Information Needs</li> <li>• Locating Historic Properties</li> <li>• Evaluating Historical Significance</li> <li>• When No Historic Properties Are Found</li> <li>• Historic Property Found</li> </ul>	36 CFR 800.4	L
		Obligations are met through the Programmatic Agreement among the DOI, Colorado State Historic Preservation Officer and the Advisory Council on Historic Preservation regarding Historic Properties at RFBTS, July 17, 1997.	
ASSESSING EFFECTS OF THE ACTIVITY ON THE PROPERTY	36 CFR 800.5	L	
DOCUMENTATION REQUIREMENTS	36 CFR 800.8	L	
CRITERIA OF EFFECT AND ADVERSE EFFECT	36 CFR 800.9	L	
PROTECTING NATIONAL HISTORIC LANDMARKS	36 CFR 800.10	L	
HISTORIC PROPERTIES DISCOVERED DURING IMPLEMENTATION	36 CFR 800.11	L	
EMERGENCY UNDERTAKINGS	36 CFR 800.12	L	
PRESERVATION OF AMERICAN ANTIQUITIES	43 CFR 3	L	

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# **NATIONAL RESOURCE AND WILDLIFE PROTECTION LAWS**

## **ARCHEOLOGICAL RESOURCES PROTECTION [ 16 USC 470, CHAPTER 1B]**

### **PROTECTION OF ARCHEOLOGICAL RESOURCES: UNIFORM REGULATIONS**

- Purpose
- Authority
- Definitions
- Prohibited Acts
- Permit Requirements and Exceptions
- Application for Permits and Information Collection
- Notification to Indian Tribes of Possible Harm to, or Destruction of,  
Sites on Public Lands Having Religious or Cultural Importance
- Relationship to Section 106 of the National Historic Preservation Act
- Custody of Archeological Resources
- Determination of Archeological or Commercial Value and Cost of  
Restoration and Repair
- Assessment of Civil Penalties
- Civil Penalty Amounts
- Other Penalties and Rewards
- Confidentiality of Archeological Resource Information
- Report

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A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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NATURAL RESOURCE AND WILDLIFE PROTECTION LAWS			
ARCHEOLOGICAL AND HISTORICAL PRESERVATION ACT (AHPA) [16 USC 469a-1]			
Notification and Request for Preservation of Data Survey of Sites; Preservation of Data; Compensation	16 USC 469a-1(a) 16 USC 469a-1(b)	L	Differs from NHPA in that it encompasses a broader scope of resources than those listed on the National Register and requires only preservation of the data (including analysis and publication).

SAFE DRINKING WATER ACT (SDWA) [42 USC 300f et. seq.]			
COLORADO PRIMARY DRINKING WATER REGULATIONS	5 CCR 1003-1,	C	Refer to RFCA Attachment 5 for surface water action levels and standards and groundwater action levels.
MAXIMUM CONTAMINANT LEVEL GOALS	40 CFR 141	C	Refer to RFCA Attachment 5 for surface water action levels and standards and groundwater action levels.

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered



Requirement	Citation	Type	Comment
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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**  
**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

The State of Colorado is authorized to administer portions of the hazardous waste management program (e.g., RCRA) to regulate the generation, treatment, storage, and disposal of hazardous waste within Colorado. As such, the Colorado regulations that are more stringent than the federal counterparts would be applicable to the management of hazardous waste. These regulations may also be relevant and appropriate in situations where a remediation waste is "sufficiently similar" to a RCRA-listed waste (e.g., waste which was generated and disposed of prior to the effective date of regulation) or when the proposed remedial action is similar to a RCRA-regulated activity and would be appropriate to ensure that the activity is protective of human health and the environment. Although the Colorado hazardous waste management regulations are similar to the federal requirements, both the federal and state regulatory citations are provided for reference purposes and to denote that both federal and state requirements were considered in establishing the identifying the ARAR requirement adopted for the remediation of the RFETS. Only substantive portions of the regulations are required under CERCLA actions for onsite activities. The State has not verified that these are the only substantive standards. The final determination is predicated upon an analysis for a specific action.

<b>SOLID WASTE DISPOSAL SITES AND FACILITIES</b>  <ul style="list-style-type: none"> <li>Definitions</li> </ul>	6 CGR 1007-2  Section 1.2	A	"Recyclable materials" means any type of discarded or waste material that is not regulated under Section 25-8-205(1)(c), C.R.S., and can be reused, remanufactured, reclaimed, or recycled
<b>IDENTIFICATION AND LISTING OF HAZARDOUS WASTES</b>	6 CCR 1007-3, 261 [40 CFR 261]	A	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**  
**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

<b>GENERATOR STANDARDS</b>				
	6 CCR 1007-3 Part 262 (40 CFR Part 262)			
• Hazardous waste determinations	.11	A/C	Persons who generate solid wastes are required to determine if the wastes are hazardous according to 6 CCR 1007-3 Parts 261, 267, 279 [40 CFR Parts 261, 266, and 279]	
• Hazardous waste accumulation areas	.34 (a)(1)(i),(ii),(iv, excluding A & B); (a)(3); (a)(4); (c)(1)	A	Persons who accumulate hazardous waste in containers or tanks must manage the waste in a manner that protects human health and the environment.	262.40-.43
<b>GENERAL FACILITY STANDARDS</b>				
	6 CCR 1007-3 Part 264, Subpart B [40 CFR Part 264, Subpart B]			
• Waste Analysis	.13 (a)	A	The owner/operator of a facility that stores, treats, or disposes of waste must verify the waste has been characterized adequately.	264.13(b)
• Security	.14	A/L	The owner/operator of a facility must prevent unauthorized access.	
• General Inspection Requirements	.15 (a), (c)	A/L	The owner/operator of a facility must inspect for malfunctions, deteriorations, and releases, and must remedy deficiencies.	264.15 (d)

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment	BMP
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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**  
**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

<ul style="list-style-type: none"> <li>Personnel Training Requirements</li> </ul>	.16 (a), (b), (c)	A/C	Personnel must be trained.	264.16(d), (e) 264.17(c)
<ul style="list-style-type: none"> <li>General Requirements for Ignitable, Reactive or Incompatible Wastes</li> </ul>	.17 (a), (b)	A/C	Wastes will be managed to prevent accidental ignition or reaction of ignitable or reactive waste, or the mixing of incompatible waste.	264.18
<b>PREPAREDNESS AND PREVENTION</b>				
<ul style="list-style-type: none"> <li>Design and Operation of a Facility</li> </ul>	6 CCR 1007-3 Part 264, Subpart C [40 CFR 264, Subpart C] .31	A/C	Design facilities to minimize the potential for fire, explosion or release of hazardous waste.	
<ul style="list-style-type: none"> <li>Required Equipment</li> </ul>	.32	A/C	Facilities must be equipped with specified equipment to mitigate incidents, should they occur.	
<ul style="list-style-type: none"> <li>Testing and Maintenance of Equipment</li> </ul>	.33	A/C	Equipment must be maintained.	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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<b>SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]</b> <b>SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]</b>				
• Access to Communications or Alarm System	.34	A/L	Employees must have access to emergency communications when managing hazardous waste.	
• Required Aisle Space	.35	A	Aisle space must be maintained to allow unobstructed access to emergency personnel and emergency equipment.	
• Arrangement with Local Authorities	.37	A/L	The owner/operator must make arrangements with specified local emergency personnel.	
<b>CONTINGENCY PLAN AND EMERGENCY PROCEDURES</b>	6 CCR 1007-3 Part 264, Subpart D [40 CFR Part 264, Subpart D]			
• Purpose and Implementation	.51 (b)	A/C	RFETS Emergency Response Plan incorporates the substantive requirements of the Contingency Plan in the Site's Part B Hazardous Waste Permit. Emergencies such as fire, explosion, or release of hazardous waste must be mitigated immediately.	
• Emergency Coordinator	.55	A	A designated employee is responsible for coordinating emergency response actions.	
• Emergency Procedures	.56 (a-i)	A		
<b>MANIFEST SYSTEM, RECORDKEEPING, AND REPORTING</b>	6 CCR 1007-3 Part 264, Subpart E [40 CFR Part 264, Subpart E]			
		A	Operating Record	264.73
		A	Recordkeeping	264.74

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**  
**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

<b>GROUND-WATER MONITORING</b>	6 CCR 1007-3 Part 264, Subpart F [40 CFR Part 264, Subpart F]	A	The substantive portions of the groundwater monitoring ARARs for each CERCLA action will be incorporated into the Integrated Monitoring Plan (IMP)	
<b>CLOSURE AND POST-CLOSURE</b>	6 CCR 1007-3 Part 264, Subpart G [40 CFR Part 264, Subpart G]			
• Closure Performance Standards	.111	A	The owner/operator must close the facility in a manner that protects human health and the environment.	
• Disposal or Decontamination of Equipment, Structures, or Soils	.114	A/C	All hazardous wastes and residues of hazardous waste must be disposed or decontaminated.	
• Post-Closure Care and Use of Property	.117	A/C	Human health and the environment must be protected after closure is complete if hazardous waste remains at the facility.	
<b>USE AND MANAGEMENT OF CONTAINERS</b>	6 CCR 1007-3 Part 264, Subpart I [40 CFR Part 264, Subpart I]			
• Condition of Containers	.171	A	Containers must be maintained in good condition.	
• Compatibility of Waste in Containers	.172	A	Wastes must be compatible with containers.	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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• Management of Containers	.173	A	Containers must be closed except when adding or removing waste.	
• Inspections	.174	A	Containers must be inspected weekly.	
• Containment				
o System Design and Operation	.175	A		
o Ignitable and Reactive Wastes	.176	A		
o Incompatible Wastes	.177	A		
• Closure	.178	A	Hazardous wastes and residues of hazardous waste must be removed or decontaminated from the unit and soils.	
• Air Emission Standards	.179	A/C	Hazardous wastes must be managed in accordance with AA, BB, CC, as appropriate.	
<b>TANK SYSTEMS</b>				
	6 CCR 1007-3 Part 264, Subpart J [40 CFR Part 264, Subpart J]			
• Design and Installation of New Tank Systems or Components	.192 (a-f)	A	Tank systems must be designed to maintain their integrity when storing or treating hazardous waste.	
• Containment and Detection of Releases	.193 (a)(i)(1,2,3,5)	A	Secondary containment must be designed to contain and detect any releases from the tank system.	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

Requirement	Citation	Type	Comment	BMP
<b>SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]</b> <b>SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]</b>				
• General Operating Requirements	.194 (a-c)	A	Tank systems must be maintained in good condition to prevent releases to the environment.	
• Inspections	.195 (b,c)	A	Inspections are conducted to identify any tank system integrity concern.	
• Response to Leaks or Spills and Disposition of Leaking or Unfit-for-Use Tank Systems	.196 (a-c),(c)	A		
• Closure and Post-Closure Care	.197 (a,b)	A	During closure, hazardous waste and hazardous waste residues must be removed from the tank system.	
• Special Requirements for Ignitable and Reactive Wastes	.198	A/C	Ignitable or reactive waste must be managed as specified in this section.	
• Special Requirements for Incompatible Waste	.199	A/C	Incompatible waste must not be introduced into a tank system unless 264.17(b) is complied with.	
• Air Emission Standards	.200	A/C	All hazardous waste shall be managed in accordance with AA, BB, CC	
<b>CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS</b>	6 CCR 1007-3 Part 264, Subpart S [40 CFR Part 264, Subpart S]			

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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<b>SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]</b> <b>SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]</b>				
• Temporary Units	.553 (a-c)	A	Temporary units allow flexibility. Justification for alternative compliance must be included in the CERCLA/RFCA decision document	
<b>MISCELLANEOUS UNITS</b>	6 CCR 1007-3 Part 264, Subpart X [40 CFR Part 264, Subpart X]			
Environmental Performance Standards	.601	A	Miscellaneous units must be designed, constructed, operated and maintained in a manner that protects groundwater, surface water, wetlands, soils, and air.	
• Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action	.602	A	Miscellaneous units must be managed to ensure compliance with 264.15 (inspections), 264.33 (testing and monitoring), 264.101 (corrective action for releases).	
• Post Closure Care	.603	A	Miscellaneous units that are disposal units must meet Post Closure Care requirements.	
<b>AIR EMISSION STANDARDS FOR TANKS, SURFACE IMPOUNDMENTS, AND CONTAINERS</b>	6 CCR 1007-3 Part 264, Subpart CC [40 CFR Part 264, Subpart CC]			
• Standards: General	.1082	A	Air emission standards must be incorporated into the design of tanks, surface impoundments, and container facilities that store or treat hazardous waste with organic concentrations equal to or greater than 10 ppm (by weight).	
• Waste Determination Procedures	.1083	A		
• Standards: Tanks	.1084	A		
• Standards: Surface Impoundments	.1085	A		
• Standards: Containers	.1086	A		

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered



Requirement	Citation	Type	Comment	BMP
SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.] SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § 25-15-101 to -217)]				
• Standards: Closed-Vent Systems and Control Devices	.1087	A		
• Inspection and Monitoring Requirements	.1088	A		.1089
CONTAINMENT BUILDINGS				
• Design and Operating Standards	6 CCR 1007-3 Part 264, Subpart DD [40 CFR Part 264, Subpart DD] .1101(a); (b); (c)(1, 3 (excluding i-iii), and 4); (d); (e)	A	Containment buildings must be designed and operated to prevent releases to the environment.	
• Closure and Post-Closure Care	.1102	A		
LAND DISPOSAL RESTRICTIONS				
• Dilution Prohibited as a Substitute for Treatment	.3	A	LDR determinations must be completed for hazardous wastes generated.	
• LDR Determination (Determination if Hazardous Waste Meets the LDR Treatment Standards)	.7	A	Land disposal restrictions apply primarily to the off-site disposal actions proposed as part of the remedial activity.	
• Special Rules for Wastes that Exhibit a Characteristic	.9 (a-c)	A		

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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<b>SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]</b>				
<b>SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]</b>				
<b>MANAGEMENT OF UNIVERSAL WASTE</b>	<b>6 CCR 1007-3 Part 273 [40 CFR Part 273]</b>			Subpart B Subpart C
• Prohibitions	.11, .31	A	A handler of universal waste is prohibited from disposing, diluting, or treating universal waste, except during responses to releases.	
• Waste Management	.13, .33	A		
• Labeling and Marking	.14, .34	A	Universal waste and the associated accumulation areas must be labeled and marked as defined in this section.	
• Employee Training	.16, .36	A	Employees must be trained about waste management requirements and on emergency procedures according to their responsibilities.	
• Response to Releases	.17, .37	A	Universal waste handlers must contain releases of universal wastes, and must manage the resulting waste, as appropriate, in accordance with the hazardous waste regulations.	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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<b>SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]</b> <b>SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]</b>				
<b>STANDARDS FOR THE MANAGEMENT OF USED OIL</b>	<b>6 CCR 1007-3 Part 279 [40 CFR Part 279]</b>			
• Used Oil Specifications	.11	A	Used oil burned for energy recovery must meet the specifications of this section	
• Prohibitions	.12	A	Used oil must not be stored in surface impoundments, be used as a dust suppressant, or be burned in unapproved units	
• Hazardous Waste Mixing	.21	A	Used oil must be characterized and managed in accordance with 269.10 and this section.	
• Used Oil Storage	.22	A	Used oil must be managed in containers or tanks in a manner that protects human health and the environment. Releases must be cleaned up and steps must be taken to prevent re-occurrence.	
• On-Site Burning in Space Heaters	.23	A	Used oil may be used as fuel for space heaters if the gases are vented to ambient air, and the maximum capacity of the space heater is not more than 0.5 million Btu per hour.	
<b>SOIL REMEDIATION POLICY DOCUMENT</b>				
• Colorado Soil Remediation Objectives Policy Document	Published by CDPHE in December, 1997	TBC	Cost effective, site-specific risk-based approach to establishing soil remediation objectives. Would be considered in manner compatible with ALP and RFCA Attachment 10.	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**

**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

<b>UNDERGROUND STORAGE TANKS</b>	<b>7 CCR 1101-14 [40 CFR Part 280]</b>			
• Performance Standards for New USTs	3.20; 4.30-4.33;	A	USTs must be designed, maintained, and operated to prevent releases from the tank systems to the environment.	
• General Operating Requirements	5.40-5.44;]	A		
• Release Detection	6.53;	A	Releases that impact soils or groundwater will be identified as a PAC, will be added to the ER Ranking List, and will be incorporated into the integrated Site remediation program.	
• Clean-Up of Spills and Overfills	7.61(b),(c);	A		
• Initial Response to Spills and Overfills	7.62(a);	A	Coordination efforts within CDPHE and the Department of Labor & Employment, Oil Inspection Section will be accomplished through communication with the LRA.	
• Initial Abatement Measures	7.63(a);	A		
• Initial Site Characterization	7.64(a),(b),(c);	A		
• Free Product Removal	7.65(a);	A		
• Investigations for Soil and Groundwater Clean-Up		A		

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**SOLID WASTE DISPOSAL ACT (aka: Resource Conservation and Recovery Act) [42 USC § 6901 et. seq.]**  
**SUBTITLE C: HAZARDOUS WASTE MANAGEMENT [Colorado Hazardous Waste Act (CRS § § 25-15-101 to -217)]**

• Temporary Closure	8.70(a),(b);	A		
• Permanent Closure and Changes-in-Service	8.71(b),(c);	A		
• Assessing the Site at Closure or Change-in-Service	8.72;	A		
• Applicability to Previously Closed UST Systems	8.73;	A		8.74

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1**

<b>PERFORMANCE STANDARDS FOR TANKS</b>	<b>7 CCR 1101-14 Part 3</b>			
• Design and Construction of Tanks	AST.31.2	A	ASTs must be designed, maintained, and operated to prevent releases to the environment.	
• Location and Installation of Outside Aboveground Tanks	AST.31.3	A		
• Location and Installation of Aboveground Storage Tanks in Vaults	AST.31.4	A		
• Normal Venting for Aboveground Tanks	AST.31.5	A		
• Emergency Relief Venting for Fire Exposure for Aboveground Tanks	AST.31.6	A		
• Vent Piping for Aboveground Tanks	AST.31.7	A		
• Tank Openings other than Vents for Aboveground Tanks	AST.31.8	A		
• Installation of Tanks Inside of Buildings	AST.31.9	A		
• Standards for Piping, Valves, and Fittings	AST.32	A		

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1**

<b>OPERATING REQUIREMENTS</b>		7 CCR 1101-14 Part 4		
• Collision Protection	AST.40	A		
• Spill and Overfill Control (excluding reporting requirements), Remote Impounding, Secondary Containment	AST.41 (excluding reporting part of AST.41.1(e))	A		
• Operation and Maintenance of Corrosion Protection	AST.42	A		
• Compatibility Requirements for all Tanks	AST.43	A		
• Static Protection for all Tanks	AST.44	A		
• Repairs Allowed (excluding requirement for approvals and inspections by State Oil Inspector)	AST.45 (excluding AST.45(b)(4))	A		
• Out-of-Service, Closure or Change-in-Service	AST.46(c)(1-5)	A		AST.46(a), (b), (c, 8-10), (b) Records and documentation

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1**

RELEASE DETECTION	7 CCR 1101-14 Part 5 AST.5	A		AST.52 Records of Inspections
RELEASE RESPONSE AND CORRECTIVE ACTION	7 CCR 1101-14 Part 7		Releases that impact soils or groundwater will be identified as a PAC, will be added to the ER Ranking List, and will be incorporated into the integrated Site remediation program.	
• Initial Response	AST.72(b), (c)	A		
• Initial Abatement Measures	AST.73	A	Coordination efforts within CDPHE and the Department of Labor & Employment, Oil Inspection	
• Repair or Closure Required	AST.74	A	Section will be accomplished through communication with the LRA.	
OIL POLLUTION PREVENTION	7 CCR 1101-14 Part 11			
• Oil Pollution Prevention: Oil Pollution Prevention SPCC Plan Requirements	AST.112.7(c), (d), (e, 1-2, 4-5)	A	A SPCC plan would not be specifically required as an ARAR; however, the substantive requirements that are incorporated into and implemented as part of the SPCC plan would be required as an ARAR. (e.g., Prediction of the direction, rate and flow of a release from a tank system need not be included in a plan; however, it must be known by the facility and be available to emergency responders at the facility.)	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered



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**Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1**

**TOXIC SUBSTANCES CONTROL ACT (TSCA) [15 USC 2601 et seq.] Relating to PCBs**

PCB USE AUTHORIZATIONS	40 CFR 761.30	A	Lists authorized uses and use restrictions for PCBs
MARKING REQUIREMENTS	40 CFR 761.40 and .45	A	Labeling of PCBs and PCB storage Areas
DISPOSAL REQUIREMENTS		A	
<ul style="list-style-type: none"> <li>Applicability</li> <li>Disposal Requirements</li> <li>PCB Remediation Waste</li> <li>PCB Bulk Product Waste</li> </ul>	761.50 761.60 761.61 761.62		General PCB Disposal Requirements Disposal Requirements  Pursuant to a letter from Kerrigan Clough to Joe Legare, Approval of Risk-Based Approach for PCB-Based Painted Concrete, November 2001, concrete painted with PCB-based paints may be left in place in the basements of demolished buildings, and concrete rubble containing PCB-based paints may be stored onsite and used as backfill.
<ul style="list-style-type: none"> <li>Disposal of R&amp;D and Chemical Analyses wastes</li> </ul>	761.64		
STORAGE REQUIREMENTS FOR PCBs	40 CFR 761.65	A	
<ul style="list-style-type: none"> <li>Facility Criteria</li> <li>Temporary Storage</li> <li>Inspections</li> <li>Container Specifications</li> <li>PCB radioactive waste</li> <li>Marking</li> <li>Laboratory Sample Exemption from Manifesting</li> </ul>			
INCINERATION	40 CFR 761.70	A	These regulations would only be ARARs for the construction and operation of an onsite PCB incinerator, it is envisioned that this will not occur
<ul style="list-style-type: none"> <li>Liquid PCBs</li> <li>Non-Liquid PCBs</li> </ul>			

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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**Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1**

HIGH EFFICIENCY BOILERS • Operating requirements	40 CFR 761.71	A	These regulations would only be ARARs for onsite burning PCB mineral oil dielectric fluid in a boiler, it is envisioned that this will not occur
SCRAP METAL RECOVERY OVENS AND SMELTERS • Operating Requirements	40 CFR 761.72	A	These regulations would only be ARARs for onsite scrap metal recovery or smelting; it is envisioned that this will not occur
CHEMICAL WASTE LANDFILLS • Design and Operating Requirements	40 CFR 761.75	A	These regulations would only be ARARs for the construction and operation of an onsite PCB disposal cell; it is envisioned that this will not occur
TSCA COORDINATED APPROVAL	40 CFR 761.77	A	Institutionalizes EPA approval of PCB activities under TSCA when activities are being conducted under another waste management permit, or other decision document issued by EPA or pursuant to a State PCB waste management program
DECONTAMINATION STANDARDS AND PROCEDURES • Self-Implementing Decontamination • Measurement-Based Decontamination	40 CFR 761.79	A	
PCB SPILL CLEANUP • Requirements for PCB Spill Cleanup	40 CFR Subpart G	TBC	40 CFR 761 Subpart G is entitled PCB Spill Cleanup Policy and thus many of the sections, specifically for spills after May 4, 1987 are "To Be Considered"
Cleanup site characterization sampling for PCB remediation waste	40 CFR Subpart N	A	Characterization requirements for cleanup of PCB remediation waste
Sampling to verify completion of self-implementing cleanup and on-site disposal of	40 CFR Subpart O	A	Not ARAR unless conducting a self implementing cleanup of PCB remediation waste

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Colorado Revised Statutes (CRS) Title 8 Article 20 Parts 7 and 2; Title 18 Article 25 Part 1				
bulk PCB remediation waste and porous surfaces				
Sampling non-porous surfaces for measurement-based use, reuse, and on-site or off-site disposal under 761361(a)(6) and determination under 761.79(b)(3)	40 CFR Subpart P	A		
Self-implementing alternative dextraction and chemical analysis procedures for non-liquid PCB remediation waste samples	40 CFR Subpart Q	A	Applicable procedures when using alternatives to required analytical methodology	
Sampling non-liquid, non-metal PCB bulk product waste for purposes of characterization for PCB disposal in accordance with 761.62, and sampling PCB remediation waste destined for off-site disposal, in accordance with 761.61	40 CFR Subpart R	A	Characterization requirements for PCB bulk product waste and PCB remediation waste when characterization for disposal is required	
Double wash/rinse method for decontaminating non-porous surfaces	40 CFR Subpart S	A	Referenced procedure from 761.79	

A - Action-Specific ARAR; C - Chemical-Specific ARAR; L - Location-Specific ARAR; TBC - To Be Considered

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Appendix M

**ACTION LEVELS FOR RADIONUCLIDES IN SOILS**

This IGD Appendix originally contained the technical basis for the development of the enforceable action levels for radionuclides in soil as defined in Attachment 5 to the Rocky Flats Cleanup Agreement. This Appendix has been superceded. For the latest technical basis for the development of radionuclide soil action levels see *Results of the Interagency Review of Radionuclide Soil Action Levels*, September 20, 2002, which is online at [www.rfets.gov](http://www.rfets.gov).

## 1.0 INTRODUCTION

DOE first developed human health risk-based Preliminary Remediation Goals (PRGs) in 1995 to establish initial site-wide cleanup targets for contaminants for each environmental medium. The PRGs have been updated regularly to conform with the evolving site conceptual model and future land use. The latest update is based on the work of the Radionuclide Soil Action Level Workgroup (RSALW), Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium, September 30, 2002). The human health PRGs are currently used in RFCA Attachment 5 as action levels for the following mediums:

- Groundwater Action Levels: Human health PRGs based on the residential groundwater ingestion scenario are used where no Maximum Contaminant Level (MCL) is available from EPA; and
- Soil Action Levels: For non-radionuclides, human health PRGs based on the wildlife refuge worker scenario are used where no applicable or relevant and appropriate requirement is available.

DOE, EPA, and CDPHE, with support from the U.S. Fish and Wildlife Service, developed ecological PRGs in 2002. Ecological receptor PRGs were only calculated for analytes originally identified by the 2002 Ecological Risk Working Group as being of site-wide potential concern to ecological receptors. The ecological receptor PRGs are currently used in RFCA Attachment 5 as action levels for soil.

Human health and ecological PRGs are reviewed and updated, as necessary, on an annual basis.

## 2.0 HUMAN HEALTH

### 2.1 Exposure Pathways

In order to standardize the risk-based PRGs across RFETS, programmatic exposure pathways and receptors were established. The following tables identify the receptors and exposure pathways selected for each environmental medium:

- Table 1: Wildlife Refuge Worker Exposure Scenario
- Table 2: Rural Resident Groundwater Exposure Scenario(wc1)

Standard calculation methods given in Risk Assessment Guidance for Superfund (RAGS), part B (USEPA, 1991) were used in developing risk-based PRG pathways where available. Most of the exposure factors for the PRGs were developed and agreed upon by the RSALW and are presented and documented in the Task 3 Report (September 30, 2002).

## 2.2 Methodology, Equations, and Assumptions

Risk-based PRGs were developed for the Target Analyte List of metals and organics for the wildlife refuge worker exposure scenario; and the residential groundwater exposure scenario. Separate risk-based equations were developed to account for the carcinogenic and/or noncarcinogenic effects of the contaminant. Risk-based PRGs for carcinogens were calculated by setting the carcinogenic target risk level at  $1E-05$  and  $1E-06$ . A target risk level of  $10^{-5}$  means that an individual has a ten-in-one million probability of developing excess cancer over a lifetime as a result of exposure to a specific contaminant; a target risk level of  $10^{-6}$  means that an individual has a one-in-one million probability of developing excess cancer over a lifetime as a result of exposure to a specific contaminant. This risk is in addition to the probability of an individual developing cancer from some other factors including environmental pollution not related to the site, heredity, or lifestyle.

Similarly, risk-based PRGs for toxicants (noncarcinogens) were calculated by setting the hazard quotient equal to 1 and 0.1 for each contaminant. A hazard quotient is the ratio of a single substance exposure level of a chemical contaminant over a specified period to the reference dose for the chemical. The reference dose represents an estimate of an exposure level for the human population, including sensitive subpopulations, that is likely to be without appreciable deleterious effects during a lifetime. When both carcinogenic and noncarcinogenic toxicity information was available both carcinogenic and noncarcinogenic risk-based concentrations were calculated and the more restrictive value was selected as the risk-based PRG.

The risk-based PRG exposure scenarios and equations provided in Tables 1 and 2 include all of the exposure pathways identified for the exposure scenario; separate risk-based PRGs were not calculated for each exposure pathway.

## 2.3 Chemical Toxicity Information

The chemical-specific toxicity values used for the calculation of the risk-based PRGs are presented in Table 3. Toxicity information used to calculate the PRGs included the carcinogenic slope factor or unit risk, and for noncarcinogenic effects, the reference dose (RfD) and reference concentration (RfC). Toxicity values were obtained from the latest information in EPA's Integrated Risk Information System (IRIS) files, the EPA Health Effects Assessment Summary Tables (HEAST), and the EPA, Region 3, PRG tables. Values for polycyclic aromatic hydrocarbons were calculated using EPA's Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons.

## 3.0 ECOLOGICAL RECEPTORS

### 3.1 Exposure Pathways and Receptors

The RFETS environment as it relates to ecological risk assessment is described in detail in *Final Ecological Risk Assessment Methodology: Sitewide Conceptual Model* (DOE 1996a). Primary exposure pathways for mammalian and avian receptors to site contaminants of

concern (COCs) are ingestion of COCs in food, ingestion of soils, and external exposure to penetrating radiation present in soils (Table 4). Secondary pathways include dermal contact, particulate inhalation, and inhalation of volatile organic released into burrows. Inhalation and dermal contact are considered minor compared to the ingestion and external exposure pathways.

The following receptors were evaluated as representative of site ecological groups to quantify PRGs:

- Fossorial (burrowing) small mammal (Prairie Dog)
- Fossorial (burrowing) small mammal (Preble's Meadow Jumping Mouse)
- Herbivorous small mammal (Deer Mouse)
- Insectivorous small mammal (Deer Mouse)
- Small ground-feeding birds (Mourning Dove)
- Avian Predator (American Kestrel)

The general exposure scenario assumed for all receptors included direct ingestion of soil, incidental ingestion of soil during feeding and burrowing, and ingestion of prey items. PRGs were also developed for external exposure to radionuclides, but these resulting soil concentrations were much higher than ingestion based PRGs. Radionuclide PRGs were based on the methodology developed by Higley and Kuperman (1995) for RFETS.

### 3.2 Methodology, Equations, and Assumptions

Risk-based PRGs were developed for a list of COCs identified by the ecological risk assessment working group. EPA's Eco Soil Screening Levels (EcoSSLs) process was used as a general guidance to develop the PRGs (EPA 2000). Extensive use was made of existing databases and compilations of ecotoxicity information, especially those from other DOE facilities such as Oak Ridge National Laboratories and Los Alamos National Laboratories.

The EcoSSL document provides general equations and procedures for developing PRGs from toxicological research, receptor-specific exposure parameters such as food ingestion rates, diet, and bioaccumulation factors (BAFs) that describe uptake of COCs from soils into forage or prey species (Table 5). Intake from multiple sources of incidental soil intake such as plant ingestion, prey ingestion etc. are summed to estimate the total intake from this exposure pathway. The general equation to calculate PRGs is also presented in Table 5.

Risk-based PRGs were then calculated by applying a target hazard quotient (HQ) equal to 1.0 for each COC and receptor. PRGs corresponding to both the No Observed Adverse Effects Levels (NOAEL) and Lowest Observed Adverse Effects Levels (LOAEL) were calculated. However, only the LOAEL concentrations are used for the RFCA PRGs with the exception of those areas deemed to be potential Preble's Meadow Jumping Mouse (PMJM) habitat.

Given the special status of this species, the ecological risk assessment working group determined that the NOAEL TRV would be used for the PMJM receptor in the areas in which the receptor may reside. [JMA2] Calculated PRGs represent soil concentrations below which no risk to wildlife populations would be predicted following exposure of specific ecological receptor species to contaminants present in soils and food.

### 3.3 Chemical Toxicity Information

Chemical-specific Toxicity Reference Values (TRVs) are presented in Table 6. TRVs were compiled for mammalian and avian species from pre-existing data reviews, guidance documents, and peer reviewed literature sources. Rodent studies were preferred for mammalian data, since the two surrogate wildlife mammalian species are rodents. Bird studies were used as sources of TRVs for avian receptors. No extrapolation between bird and mammalian toxicity information was used to calculate the PRGs.

Available NOAELs and LOAELs for site soil COCs were chosen based on the following criteria:

- Oral exposure studies from which a dose could be determined.
- Generally, only chronic or subchronic studies were used. However, some acute studies where reproductive and developmental endpoints were assessed during discrete, critical life stages.
- Growth and mortality endpoints.

Following initial compilation of TRVs presented, primary study papers were obtained, when possible. Database TRV values were then confirmed by review of the original study documents. It should be noted that no adjustments of the original TRVs were made for study duration. Nor was an analysis of study "quality" conducted to weight the TRVs according to EcoSSL guidance.

NOAEL and LOAEL TRVs were compiled from the database of preliminary TRVs discussed above. Average TRVs were calculated by obtaining the arithmetic mean of several groups of endpoints. Individual average TRVs were then calculated for growth, reproductive, and mortality endpoints for those COCs where available. In addition, an average TRV was calculated for each COC using a compilation of all sub-lethal endpoints available from the literature search and databases. These TRVs were then used to quantify final PRGs.

Bioaccumulation Factors (BAFs) (Table 7) were identified and calculated for use in the PRG development process. As with the TRV selection process, the procedures used in the selection of BAFs closely corresponded to those developed in the EcoSSL guidance (USEPA 2000). BAFs are either simple ratios of COC concentrations between biota and soils, or based on quantitative relationships such as linear, logarithmic, or exponential equations.

BAFs were calculated or identified for the following pathways:



- Soil to Plant
- Soil to Terrestrial Invertebrate
- Soil to Small Mammal
- Soil to Bird

BAFs were obtained from several publicly available databases, peer reviewed literature, and from approved ERAs at other sites that are applicable to the CSM and data uses for RFETS.

#### 4.0 RFETS PRGS

Tables 8 and 9 are a summary of the human health PRGs for each exposure scenario.

Table 9 is a summary of the ecological PRGs for each receptor.

Table 1. Wildlife Refuge Worker Exposure Scenario

The Wildlife Refuge Worker Surface Soil Exposure Scenario consists of the following pathways: ingestion of surface soil, outdoor inhalation of dust (inhalation of volatiles is not assessed (w/c3)), and dermal contact for nonradionuclides for a wildlife refuge worker working at the site for an average of 18.7 years, spending 50% of this time outdoors. Exposures for radionuclides are not assessed in this spreadsheet (refer to the RSALS Task 3 Report and Appendices [Sept. 2002]). The worker is assessed as spending all of their time on the most contaminated areas of the site, and performs soil-contact intensive activities. This scenario includes all complete and significant exposure pathways and parameter assumptions that were evaluated in the Task 3 Report and Appendices, as well as the dermal pathway. Calculations in this spreadsheet are performed deterministically.				
Exposure Parameter	Variable	Unit	Point Estimate*	Source
<b>General Assumptions</b>				
Target hazard index - 1	THI-1	--	0.1	EPA, 1991a
Target excess lifetime cancer risk - 1	TR-1	--	1E-06	EPA, 1991a
Target hazard index - 2	THI-2	--	1	EPA, 1991a
Target excess lifetime cancer risk - 2	TR-2	--	1E-05	EPA, 1991a
Adult body weight	BW_A	kg	70	EPA, 1991b
<b>Wildlife Refuge Worker Exposure Scenario Assumptions</b>				
Exposure duration	ED_WRW	yr	18.7	RSALS, 2002
Exposure frequency	EF_WRW	day/yr	250	RSALS, 2002
Exposure time-outdoors	ET_WWR	hr/day	4	RSALS, 2002
Averaging time - noncarcinogenic	AT_NC	yr	18.7	RSALS, 2002
Averaging time - carcinogenic	AT_C	yr	70	EPA, 1991b
Exposure time fraction, outdoor	Eto_WRW	--	1	RSALS, 2002
Exposure time fraction, indoor	Eti_WRW	--	0	RSALS, 2002
Hourly inhalation rate adult worker	HIR_A_WRW	m3/hr	1.3	RSALS, 2002
Site-specific PEF based on ML	PEF	m3/kg	14925373	RSALS, 2002
Soil Ingestion Rate	SIR_A_WRW	mg/day	100	RSALS, 2002
Skin-soil adherence factor	AF_A_WRW	mg/cm2-event	0.117	EPA, 2001
Event frequency	EV	events/d	1	EPA, 2001
Skin surface area	SA_A_WRW	cm2	3300.00	EPA, 2001
Dermal absorption fraction	ABS	--	chemical-specific	EPA, 2001
<b>Toxicity Values</b>				
Oral reference dose	RfDo	mg/kg-day	chemical-specific	IRIS, HEAST or NCEA
Oral cancer slope factor	CSFo	(mg/kg-day) <sup>-1</sup>	chemical-specific	IRIS, HEAST or NCEA
Inhalation reference dose	RfDi	mg/kg-day	chemical-specific	IRIS, HEAST or NCEA
Inhalation cancer slope factor	CSFi	(mg/kg-day) <sup>-1</sup>	chemical-specific	IRIS, HEAST or NCEA

Sources:

EPA, 1991a = U.S. Environmental Protection Agency. 1991. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals. Interim. Office of Emergency and Remedial Response, Washington, D.C. Publication 9285.7-01B. December.

EPA, 1991b = U.S. Environmental Protection Agency. 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.6-03. March 25.

EPA, 2000 = U.S. Environmental Protection Agency. 2000. Soil Screening Guidance for Radionuclides: Technical Background Document. Office of Radiation and Indoor Air, Washington, D.C. Publication EPA/540-R-00-006. October, 2000.

EPA, 2000b = U.S. Environmental Protection Agency. Risk Assessment Guidance for Superfund Vol. I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim Guidance. Office of Emergency and Remedial Response, Washington, D.C.  
EPA, 2001 = U.S. Environmental Protection Agency. 2001. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Peer Review Draft. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER 9355.4-24. March.  
RSAL 2002= U.S. DOE, U.S. EPA and CDPHE, 2002. Task 3 Report and Appendices: Calculation of Surface Radionuclide Soil Action Levels for Plutonium, Americium, and Uranium, September 30.

Equations used for the 2002 WLRW PRG spreadsheets:

WLRW PRG Before Worker Surface Soil Exposure Scenario

$$\text{Noncarcinogenic PRG} = \left( \frac{(TH \times AT_{NC}) \times 365(\text{d/y})}{(SRLA\_WRW(\text{mg/d}) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times 10^{-6}(\text{g/mg}) \times 1/100(\text{mg/kg}) \times 1/50(\text{kg})} + \frac{(SRLA\_WRW(\text{mg/d}) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times ET\_SS\_WRW(\text{mg/d}) \times 1/PEP(\text{m}^2/\text{kg}) \times 1/100(\text{mg/kg}) \times 1/50(\text{kg}) \times (ETL\_WRW + ETL\_WRW \times DFB))}{(AF\_A\_WRW(\text{mg/cm}^2) \times AF\_A\_WRW(\text{mg/cm}^2) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times ABS \times EV(\text{events/d}) \times 1/100(\text{mg/kg}) \times 10^{-6}(\text{g/mg}) \times 1/50(\text{kg})} \right)$$

• for volatile compounds, substitute the chemical-specific volatilization factor, VF, found on the newChemTrans sheet for PEF

$$\text{Carcinogenic PRG} = \left( \frac{(TR \times AT_C) \times 365(\text{d/y})}{(SRLA\_WRW(\text{mg/d}) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times 10^{-6}(\text{g/mg}) \times CSF\_risk(\text{mg/kg/d}) \times 1/50(\text{kg})} + \frac{(SRLA\_WRW(\text{mg/d}) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times ET\_SS\_WRW(\text{mg/d}) \times 1/PEP(\text{m}^2/\text{kg}) \times 1/100(\text{mg/kg}) \times 1/50(\text{kg}) \times (ETL\_WRW + ETL\_WRW \times DFB))}{(AF\_A\_WRW(\text{mg/cm}^2) \times AF\_A\_WRW(\text{mg/cm}^2) \times EF\_WRW(\text{d/y}) \times ED\_WRW(\text{y}) \times ABS \times EV(\text{events/d}) \times CSF\_risk(\text{mg/kg/d}) \times 10^{-6}(\text{g/mg}) \times 1/50(\text{kg})} \right)$$

• for volatile compounds, substitute the chemical-specific volatilization factor, VF, found on the newChemTrans sheet for PEF

**Table 2. Rural Resident Groundwater Exposure Scenario**

The Rural Residential Groundwater Exposure Scenario consists of the following pathway: ingestion of groundwater. Inhalation of volatiles is not considered. The resident ingests groundwater while living at the site for 30 years. It is assumed that the rural resident will live on a 5-acre ranchette, which would be part of a development. It is unlikely that shallow groundwater would be ingested due to limitations in ability for the shallow aquifer to supply water in sufficient quantity. This scenario is for use in the development of the groundwater Action Levels. Calculations in this spreadsheet are performed deterministically.				
Exposure Parameter	Variable	Unit	Point Estimate*	Source
<b>General Assumptions</b>				
Target hazard index-1	THI-1	--	0.1	EPA, 1991a
Target excess lifetime cancer risk-1	TR-1	--	1E-06	EPA, 1991a
Target hazard index-2	THI-2	--	1	
Target excess lifetime cancer risk-2	TR-2	--	1E-05	
Adult body weight	BW_A	kg	70	EPA, 1991b
Child body weight	BW_C	kg	15	EPA, 1991b
<b>Residential Exposure Scenario Assumptions</b>				
Averaging time - noncarcinogenic	AT_NC	yr	30	EPA, 1991b
Averaging time - carcinogenic	AT_C	yr	70	EPA, 1991b
Exposure frequency	EF_RR	day/yr	350	EPA, 1991b
Exposure duration	ED_A	yr	30	EPA, 1991b
Daily water ingestion rate	IRw	L/day	2	EPA, 1991b
<b>Toxicity Values</b>				
Oral reference dose	RfDo	mg/kg-day	chemical-specific	IRIS, HEAST or NCEA
Oral cancer slope factor	CSFo	risk/(mg/kgd)	chemical-specific	IRIS, HEAST or NCEA
Inhalation reference dose	RfDi	mg/kg-day	chemical-specific	IRIS, HEAST or NCEA
Inhalation cancer slope factor	CSFi	risk/(mg/kgd)	chemical-specific	IRIS, HEAST or NCEA

EPA, 1991a = U.S. Environmental Protection Agency. 1991. Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals. Interim. Office of Emergency and Remedial Response, Washington, D.C. Publication 9285.7-01B. December.  
EPA, 1991b = U.S. Environmental Protection Agency. 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.6-03. March 25.

Residential Groundwater Exposure Scenario Equations

Noncarcinogenic PPRG =  $((THI \times AT\_NC(y) \times 365(d/y)) / (IRw(L/d) \times EF\_RR(d/y) \times ED\_A(y) \times 1/RfD_o(mg/kgd) \times 1/BW\_A(kg)))$

Carcinogenic PRG =  $((TR \times AT\_C(y) \times 365(d/y)) / (IRw(L/d) \times EF\_RR(d/y) \times ED\_A(y) \times CSF_o(risk/mg/kgd) \times (1/BW\_A(kg))))$

Table 3. Toxicity Values Used for the RFETS Human Health PRGs

Target Analyte List Chemical <sup>1</sup>	CAS Number	Oral RfD <sup>2</sup> (mg/kg-day)	Oral/Ingestion Slope Factor <sup>3</sup> (mg/kg-day) <sup>-1</sup>	Inhal RfC (mg/m <sup>3</sup> )	Inhalation Unit Risk (m <sup>3</sup> /μg)	Inhalation RfD (mg/kg-day)	Inhalation Slope Factor (mg/kg-day) <sup>-1</sup>
Acenaphthene	(V) 83-32-8	6.00E-02	I				
Acetone	(V) 67-64-1	1.00E-01	I				
Aldrin	309-00-2	3.00E-05	I	1.70E+01	I	4.90E-03	1.70E+01
Aluminum	7429-90-5	1.00E+00	E	3.50E-03	E	1.00E-03	E
Anthracene	(V) 120-12-7	3.00E-01	I				
Antimony	7440-38-0	4.00E-04	I				
Aroclor 1016	12674-11-2	7.00E-05	I	7.00E-02	I	5.70E-04	I
Aroclor 1221	11104-28-2			2.00E+00	Ia	1.14E-04	Ia
Aroclor 1232	11141-16-5			2.00E+00	Ia	1.14E-04	Ia
Aroclor 1242	63469-21-9			2.00E+00	Ia	1.14E-04	Ia
Aroclor 1248	12872-29-8			2.00E+00	Ia	1.14E-04	Ia
Aroclor 1254	11097-69-1	2.00E-05	I	2.00E+00	Ia	1.14E-04	Ia
Aroclor 1260	11099-82-5			2.00E+00	Ia	1.14E-04	Ia
Arsenic	7440-38-2	3.00E-04	I	1.50E+00	I	4.30E-03	I
Barium	7440-39-3	7.00E-02	+				
Benzene	(V) 71-43-2	3.00E-03	E	5.50E-02	E	7.80E-06	E
alpha-BHC	319-84-6			6.30E+00	I	1.80E-03	I
beta-BHC	319-85-7			1.80E+00	I	5.30E-04	I
delta-BHC	319-86-8						
gamma-BHC (Lindane)	56-69-9	3.00E-04	I	1.30E+00	H		
Benzo(a)anthracene	56-65-3			7.30E-01	E		
Benzo(a)pyrene	50-32-8			7.30E+00	I	8.60E-04	E
Benzo(b)fluoranthene	205-99-2			7.30E-01	E		3.10E-01
Benzo(k)fluoranthene	207-08-9			7.30E-02	E		
Benzoic Acid (at pH 7)	65-85-0	4.00E+00	I				
Benzyl Alcohol	100-51-6	3.00E-01	H				
Beryllium	7440-41-7	2.00E-03	I				
bis(2-chloroethyl)ether	(V) 111-44-4			1.10E+00	I	2.40E-03	I
bis(2-chloroisopropyl)ether	(V) 39638-32-9	4.00E-02	I	7.00E-02	H	3.30E-04	I
bis(2-ethylhexyl)phthalate	117-81-7	2.00E-02	I	1.40E-02	I	1.00E-05	H
Bromochloromethane	(V) 75-27-4	2.00E-02	I	6.20E-02	I		1.40E-02

01-N

[illegible]

Table 3. Toxicity Values Used for the RFETS Human Health PRGs

1,1-Dichloroethane	(V)	75-34-3	1.00E-01	H			5.00E-01	H			1.43E-01	A	
1,2-Dichloroethane	(V)	107-06-2	3.00E-02	E	9.10E-02	I	5.00E-03	E	2.60E-05	I			9.10E-02
1,1-Dichloroethene	(V)	75-35-4	9.00E-03	I	6.00E-01	I			5.00E-05	I			1.75E-01
1,2-Dichloroethene (total)	(V)	640-59-0	9.00E-03	H									
2,4-Dichlorophenol (at pH 8.8)		120-83-2	3.00E-03	I									
1,2-Dichloropropene	(V)	78-87-5			6.80E-02	H	4.00E-03	I			1.14E-03	I	
cis-1,3-Dichloropropene	(V)	10081-01-5	3.00E-02	lc	1.00E-01	I	2.00E-02	lc	4.00E-03	lc	5.71E-03	lc	1.40E+01
trans-1,3-Dichloropropene	(V)	10081-02-6	3.00E-02	lc	1.00E-01	I	2.00E-02	lc	4.00E-03	lc	5.71E-03	lc	1.40E+01
Dieldrin		60-57-1	5.00E-05	I	1.60E+01	I			4.60E-03	I			1.60E+01
Diethylphthalate		84-68-2	8.00E-04	I									
2,4-Dimethylphenol	(V)	105-67-9	2.00E-02	I									
Dimethylphthalate		131-11-3	1.00E+01	W									
4,6-Dinitro-2-methylphenol (4,6-dinitro-cresol)	(V)	634-82-1	1.00E-03	E									
2,4-Dinitrophenol		51-28-5	2.00E-03	I									
2,4-Dinitrotoluene		121-14-2	2.00E-03	I	6.80E-01	I							
2,6-Dinitrotoluene		608-20-2	1.00E-03	H	6.80E-01	I							
Di-n-octylphthalate		117-84-0	2.00E-02	H					4.00E-06	E			1.40E-02
Endosulfan I		959-98-8	6.00E-03	I									
Endosulfan II		33213-65-9	6.00E-03	I									
Endosulfan sulfate		1031-07-8	6.00E-03	I									
Endosulfan (technical)		115-28-7	6.00E-03	I									
Endrin (technical)		72-20-8	3.00E-04	I									
Ethylbenzene	(V)	100-41-4	1.00E-01	I			1.00E+00	I			2.86E-01	I	3.85E-03
Fluoranthene		208-44-0	4.00E-02	I									
Fluorene	(V)	86-73-7	6.00E-02	I									
Heptachlor		76-44-8	6.00E-04	I	4.50E+00	I			1.30E-03	I			4.50E+00
Heptachlor epoxide		1024-57-3	1.30E-05	I	9.10E+00	I			2.60E-03	I			9.10E+00
Hexachlorobenzene		118-74-1	8.00E-04	I	1.80E+00	I			4.80E-04	I			1.80E+00
Hexachlorobutadiene		87-68-3	2.00E-04	H	7.80E-02	I			2.20E-05	I			7.80E-02
Hexachlorocyclopentadiene		77-47-4	6.00E-03	I			7.00E-05	I			5.70E-05	I	
Hexachloroethane		67-72-1	1.00E-03	I	1.40E-02	I			4.00E-06	I			1.40E-02
Indeno(1,2,3-cd)pyrene		183-39-5			7.30E-01	E			8.80E-02	E			
Iron		7439-89-6	3.00E-01	E									

Table 3. Toxicity Values Used for the RFETS Human Health PRGs

Isophorone		78-59-1	2.00E-01	I	9.50E-04	I							
Lead		7439-92-1											
Lithium		7439-93-2	2.00E-02	E									
Magnesium		7439-95-4											
Manganese (Food)		7439-98-6	1.40E-01	I							1.43E-05	I	
Mercury (elemental)		7439-97-8					3.00E-04	H			8.60E-05	I	
Methoxychlor		72-43-5	5.00E-03	I									
Methylene chloride (dichloromethane)	(V)	75-09-2	5.00E-02	I	7.50E-03	I	3.00E+00	H	4.70E-07	I	8.57E-01	H	1.65E-03
2-Methylnaphthalene	(V)	91-57-6	2.00E-02	E									
4-Methyl-2-pentanone (methyl isobutyl ketone)	(R)	108-10-1	5.00E-02	H			5.00E-02	H			2.29E-02	H	
2-Methylphenol (o-cresol)		95-48-7	5.00E-02	I									
4-Methylphenol (p-cresol)		105-44-5	5.00E-03	H									
Molybdenum		7439-98-7	5.00E-03	I									
Naphthalene	(V)	91-20-3	2.00E-02	I			3.00E-03	I			9.00E-04	I	
Nickel (soluble)		7440-02-0	2.00E-02	I									
2-Nitroaniline		89-74-4					2.00E-04	H			5.71E-05	H	
Nitrobenzene	(V)	98-95-3	5.00E-04	I			2.00E-03	H			4.00E-04	A	
4-Nitrophenol	(V)	100-02-7	5.00E-03	E									
n-Nitrosodiphenylamine	(V)	86-30-8			4.90E-03	I							
n-Nitrosodipropylamine		621-64-7			7.00E+00	I							
Pentachlorophenol		87-88-5	3.00E-02	I	1.20E-01	I							
Phenol		108-95-2	5.00E-01	I									
Pyrene		129-00-0	3.00E-02	I									
Selenium		7782-49-2	5.00E-03	I									
Silver		7440-22-4	5.00E-03	I									
Strontium		7440-24-8	5.00E-01	I									
Styrene	(V)	100-42-5	2.00E-01	I			1.00E+00	I			2.88E-01	I	
1,1,2,2-Tetrachloroethane	(V)	78-34-5	5.00E-02	E	2.00E-01	I			5.80E-05	I			2.00E-01
Tetrachloroethane	(V)	127-18-4	1.00E-02	I	5.20E-02	E	5.00E-01	E	5.80E-07	E			2.03E-03
Tin		7440-31-5	5.00E-01	H									
Toluene	(V)	108-88-3	2.00E-01	I			4.00E-01	I			1.14E-01	I	
Toxaphene		8001-35-2			1.10E+00	I			3.20E-04	I			1.10E+00
1,2,4-Trichlorobenzene	(V)	120-82-1	1.00E-02	I			2.00E-01	H			5.71E-02	H	



Table 3. Toxicity Values Used for the RFETS Human Health PRGs

1,1,1-Trichloroethane	(V)	71-55-6	2.80E-01	E			2.20E+00	E			6.30E-01	E	
1,1,2-Trichloroethane	(V)	79-00-5	4.00E-03	I	5.70E-02	I			1.60E-05	I			5.60E-02
Trichloroethene	(V)	79-01-6	3.00E-04	E	4.00E-01	E			1.70E-06	I	1.00E-02	E	4.00E-01
2,4,5-Trichlorophenol		95-95-4	1.00E-01	I									
2,4,6-Trichlorophenol		88-06-2			1.10E-02	I			3.10E-06	I			1.00E-02
Uranium (soluble salts)		No CASN	3.00E-03	I									
Vanadium		7440-62-2	7.00E-03	H									
Vinyl acetate		108-05-4	1.00E+00	H			2.00E-01				5.71E-02	I	
Vinyl chloride (dust and child)	(V)	75-01-4	3.00E-03	I	1.40E+00	I	1.00E-01	I	8.8E-06		2.80E-02	I	3.00E-02
Vinyl chloride (adult)	(V)	75-01-4	3.00E-03	I	7.20E-01		1.00E-01		4.4E-06		2.80E-02		1.54E-02
Xylene (total)	(V)	1330-20-7	2.00E+00	I									
Zinc		7440-68-6	3.00E-01	I									
Nitrate		14797-55-8	1.60E+00	I									
Nitrite		14797-65-0	1.00E-01	I									
Ammonium (as Ammonia)		7664-41-7					1.00E-01	I			2.86E-02	I	
		7782-41-4	6.00E-02	I									

Notes:

1. Only those constituents in ALF are included.

Sources:

- I = IRIS H = HEAST A = HEAST Alternate W = Withdrawn from IRIS or HEAST  
E = EPA-NCEA provisional value F = Federal Guidance Report No. 13 O = other  
(V) = Chemicals listed are volatile.  
a = Values given are for PCBs.  
b = Values given are for chlordane (CAS no. 12789-03-6).  
c = Values given are for 1,3-dichloropropane.

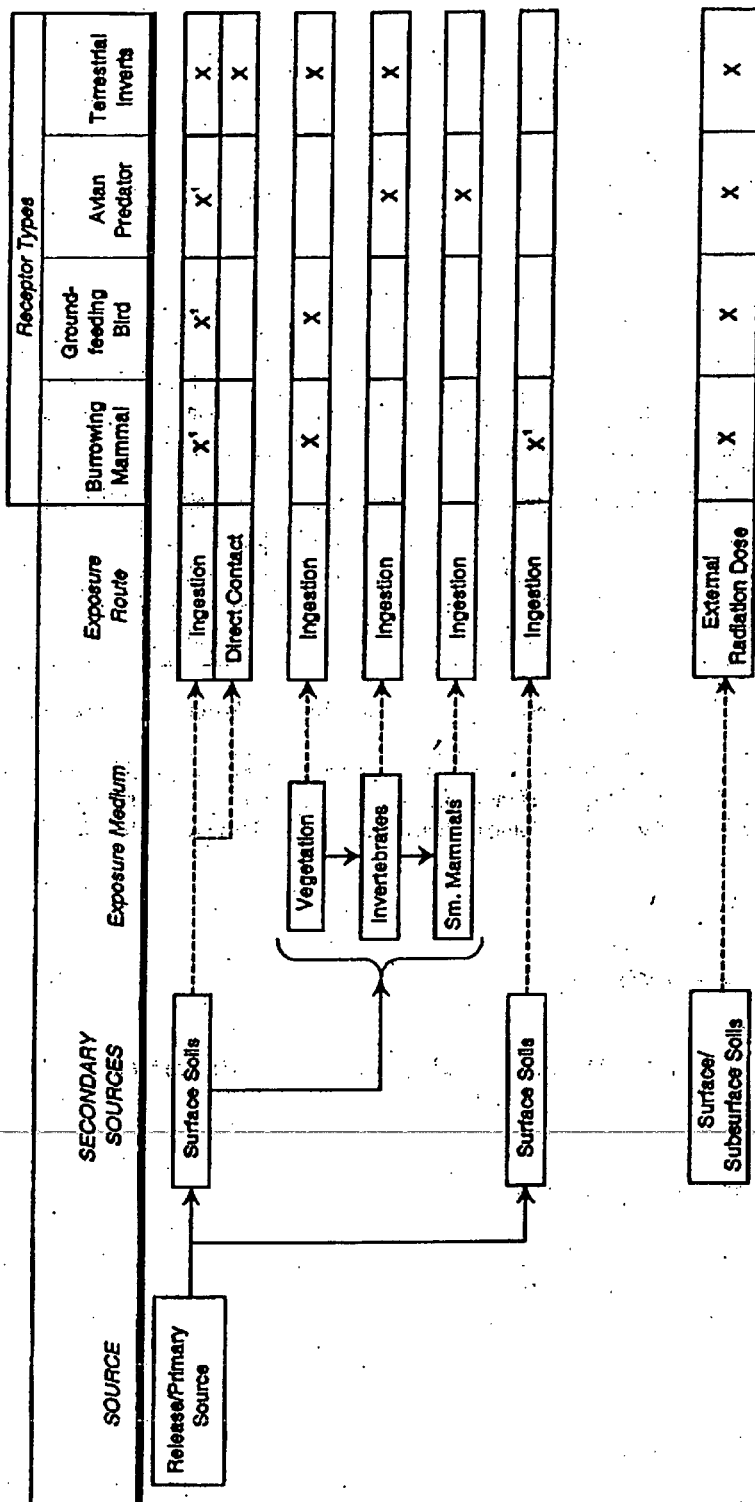
References:

EPA, 1993 = U.S. Environmental Protection Agency. 1993. Research and Development-Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Prepared for the Office of Health and Environmental Assessment by the Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Cincinnati, OH. Final Draft. EGAO-CIN-842. March.

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May 28, 2003

EPA, 1997 = U.S. Environmental Protection Agency. 1997. Region III Risk-Based Concentration Table. Philadelphia, PA. October 22. HEAST, 1997 = U.S. Environmental Protection Agency. 1997. Health Effects Assessment Summary Tables, FY-1997 Annual. Office of Solid Waste and Emergency Response, Washington, D.C. EPA/540/R-97/036. July. EPA, 1999. Federal Guidance Report No. 13, Eckerman, K.F., Leggett, R.W., Nelson, C.B., Puskin, J.S., and Richardson, A.C.B. "Cancer Risk Coefficients for Environmental Exposure to Radionuclides," EPA 402-R-99-001.  
IRIS, 2002 = U.S. Environmental Protection Agency. 2002. Integrated Risk Information System. On-line database. Office of Research and Development, Cincinnati, OH. April.

Table 4. Conceptual Exposure Model for Receptors Included in RFETS Ecological PRG Development Process



X<sup>1</sup> Indicates potentially significant exposure pathway  
X<sup>2</sup> Incidental ingestion of surface and subsurface soils

Table 5. Ecological Receptor Exposure Assumptions

Exposure Parameter	Variable	Units	Prairie Dog	Deer Mouse (Herbivore)	Deer Mouse (Insectivore)	PMJM	Mourning Dove	Kestrel
Body Weight	BW	kg	0.9	0.02	0.02	0.019	0.115	0.124
Food Ingestion Rate	FIR	Kg /kg BW-day	0.65	0.17	0.17	0.17	0.23	0.3
Soil Ingestion Rate	P <sub>soil</sub>	% of FIR	7.7	2.9	2.9	2.9	16	5
Percent Diet	Percent	%	100 Plant	100 Plant	100 Invertebrate	100 Plant	100 Seed	50-Insects 50-Animal
Toxicity Reference Value	TRVs	mg/kg BW-day	Specific	Specific	Specific	Specific	Specific	Specific
Soil Bio Availability	AF	Unitless	1.0	1.0	1.0	1.0	1.0	1.0
Area Use Factor	AUF	Unitless	1.0	1.0	1.0	1.0	1.0	1.0
Bio Accumulation	BAF	Unitless	Specific	Specific	Specific	Specific	Specific	Specific

Sources: USEPA. 2000. Ecological Soil Screening Level Guidance. Office of Emergency and Remedial Response. USEPA. 1993. Wildlife Exposure Factors Handbook. Office of Emergency and Remedial Response. Higley, K. and R. Kuperman. 1995. Radiological Benchmarks for Wildlife at Rocky Flats Environmental Technology Site.

Target Risk HQ = 1.0, where HQ = Intake/TRV.

$$\text{Intake} = [(\text{Soil Concentration} * P_{\text{soil}} * \text{FIR} * \text{AF}_{\text{soil}}) + \sum_{i=1}^n (\text{BAF}_i * \text{Soil Concentration}) * P_{\text{food}} * \text{FIR} * \text{AF}_{\text{food}}] / \text{AUF}$$

$$\text{PRG} = \text{TRV} * \text{HQ} / \text{IR}_{\text{food}} * (P_{\text{soil}} + (\text{BAF}_1 * \text{BAF}_2))$$

Table 6. Summary of Mammalian and Avian TRVs

	Endpoint	Mean Mammalian TRV (mg/kg day)		Mean Avian TRV (mg/kg day)	
		NOAEL	LOAEL	NOAEL	LOAEL
Acetone	All Sublethal Endpoints	3920 (5)	3476 (3)	No Reliable TRVs	
	Reproduction	4730 (4)	3450 (2)		
	Developmental	—	3500 (1)		
Aroclor 1254	All Sublethal Endpoints	535 (19)	20.7 (14)	34.3 (6)	56.1 (9)
	Mortality	—	47.9 (3)	—	5.89 (2)
	Reproduction	5.08 (4)	10 (2)	2.5 (1)	21.6 (4)
	Developmental	4.48 (5)	19.9 (8)	0.021 (1)	25.0 (2)
Aroclor	All Sublethal Endpoints	4.88 (7)	8.43 (5)	2.83 (2)	5.98 (3)
	Mortality	—	—	51 (1)	128 (1)
	Developmental	6.43 (5)	14.9 (4)	—	—
Benzo(a)anthracene	All Sublethal Endpoints	No Reliable TRVs		No Reliable TRVs	
Benzo(a)pyrene	All Sublethal Endpoints	71.1 (3)	113 (4)	No Reliable TRVs	
	Reproduction	86.7 (2)	160 (1)		
	Developmental	40 (1)	96.7 (3)		
Benzo(b)fluoranthene	All Sublethal Endpoints	No Reliable TRVs		No Reliable TRVs	
Benzo(k)fluoranthene	All Sublethal Endpoints	No Reliable TRVs		No Reliable TRVs	
Beryllium	All Sublethal Endpoints	1.9 (4)	1.1 (1)	No Reliable TRVs	
Carbon Tetrachloride	All Sublethal Endpoints	26 (2)	756 (2)	No Reliable TRVs	
	Reproduction	26 (2)	—		
	Developmental	—	756 (2)		
Chloroform	All Sublethal Endpoints	178 (14)	239 (7)	No Reliable TRVs	
	Mortality	—	192 (5)		
	Reproduction	201 (10)	297 (4)		
	Developmental	120 (4)	161 (3)		
Hexachlorocyclohexane	All Sublethal Endpoints	240 (6)	543 (6)	No Reliable TRVs	
	Mortality	—	821 (3)		
	Reproduction	134 (2)	500 (2)		
	Developmental	134 (2)	500 (2)		
Lead	All Sublethal Endpoints	1 (1)	40.6 (2)	39 (3)	11.3 (1)
	Reproduction	1 (1)	40.6 (2)	2.49 (2)	11.3 (1)
Methyl Ethyl Ketone	Reproduction	1770 (1)	4570 (1)	No Reliable TRVs	
Methylene Chloride	All Sublethal Endpoints	118 (4)	139 (3)	No Reliable TRVs	
	Mortality	100 (1)	300 (2)		
Tetrachloroethene	All Sublethal Endpoints	14 (1)	770 (6)	No Reliable TRVs	
	Mortality	—	429 (2)		
	Reproduction	—	900 (1)		
	Developmental	—	900 (1)		
Trichloroethene	All Sublethal Endpoints	613 (10)	814 (11)	No Reliable TRVs	
	Mortality	450 (1)	2660 (8)		
	Reproduction	258 (3)	958 (3)		
	Developmental	390 (4)	719 (4)		
Thallium	All Sublethal Endpoints	—	0.74 (1)	No Reliable TRVs	
Toluene	All Sublethal Endpoints	—	417 (5)	No Reliable TRVs	
	Mortality	—	2500 (2)		
	Reproduction	—	260 (1)		
	Developmental	—	435 (3)		
Uranium	All Sublethal Endpoints	6.13 (1)	10.2 (2)	160 (1)	—
	Reproduction	6.13 (1)	153 (1)	—	—
Vanadium	All Sublethal Endpoints	29.5 (3)	24.6 (5)	11.4 (1)	114 (1)
	Reproduction	29.5 (3)	60 (2)		
	Developmental	—	2.1 (1)		
Vinyl Chloride	All Sublethal Endpoints	—	1.7 (1)	No Reliable TRVs	
	Mortality	0.014 (1)	2.48 (3)		
<b>Radionuclides - PRGs for Internal and External Exposure (Hickey and Klerman 1993)</b>					
Radium-228	Limiting Species (pCi/g)	3.50E+00			
Uranium-233/234	Limiting Species (pCi/g)	1.80E+03			
Uranium-235	Limiting Species (pCi/g)	1.90E+03			
Uranium-238	Limiting Species (pCi/g)	1.60E+03			
Plutonium-239/240	Limiting Species (pCi/g)	3.80E+03			
Americium-241	Limiting Species (pCi/g)	1.90E+03			

**BOLD** - Bold font indicates that the Mean LOAEL is less than the Mean NOAEL.

(#) - The number in parentheses indicates the number of database records used to calculate the mean TRV.

— - Indicates that no TRVs for the specific endpoint are available.

Table 7  
Summary of Bioaccumulation Factors (BAFs) RFETS Ecological Risk Assessment

	1st Trophic Level Bioaccumulation Factors		2nd Trophic Level Bioaccumulation Factors	
	Soil to Plant	Soil to Invertebrate	Soil to Mammal *	Soil to Bird*
Acetone	25.3 (1)	0.045 (4)	2.17E-11	8.34E-11
Aroclor 1254	0.009 (1)	0.19(9)	0.09 (8)	0.09 (8)
Arsenic	0.555 (2)	0.266 (5)	0.006 (7)	0.006 (7)
Benz(a)anthracene	0.141 (1)	0.03 (6)	1.73E-05	6.63E-05
Benzo(a)pyrene	0.080 (1)	0.07 (6)	4.86E-05	1.87E-04
Benzo(b)fluoranthene	0.095 (1)	0.07 (6)	5.75E-05	2.22E-04
Benzo(k)fluoranthene	0.095 (1)	0.08 (6)	5.73E-05	2.20E-04
Beryllium	0.714 (3)	0.22 (6)	1.44E-06	NV
Carbon Tetrachloride	1.81 (1)	12.3 (4)	NV	NV
Chloroform	3.56 (1)	2.93 (4)	3.22E-09	1.23E-08
Hexachloroethane	0.345 (1)	NV	NV	NV
Lead	0.343 (2)	6.33 (5)	0.192 (7)	0.192 (7)
Methyl Ethyl Ketone	16.2 (1)	0.117 (4)	NV	NV
Methylene Chloride	5.35 (1)	1.23 (4)	NV	NV
Tetrachloroethene	2.17 (1)	8.43 (4)	NV	NV
Trichloroethene	2.39 (1)	6.85 (4)	NV	NV
Thallium	4.85 (3)	0.22 (6)	0.112 (7)	0.112 (7)
Toluene	1.88 (1)	11.4 (4)	NV	NV
Uranium	0.155 (3)	0.337 (3)	0.087 (3)	0.087
Vanadium	0.01 (3)	0.138 (3)	NV	NV
Vinyl Chloride	6.01 (1)	0.964 (4)	5.05E-10	1.95E-09

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(1) BCF is estimated using the log Kow value and equations from USEPA SSL Guidance (2000) modified from Travis and Arms (1988)

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(2) Mean BCF calculated in ORNL (1998) - Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants

(3) Derived from empirical data

(4) BCF was calculated using the log Kow equations from Southworth et al. (1978)

(5) Mean BCF calculated in Sample et al. (1998) - Development and Validation of Bioaccumulation Models for Earthworms

(6) BCF from USEPA (1999) Draft Combustor Risk Assessment Guidance was used.

(7) Mean BCF calculated in Sample et al. (1998) - Development and Validation of Bioaccumulation Models for Small Mammals

(8) BCF from Charters (1991)

(9) BCF from Paine et al. (1993)

\* Soil to mammal and soil to bird BCFs taken from USEPA (1999) for Soil to Deer Mouse and Soil to Mourning Dove (Table D-3)

except where noted

NV = No value available

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

Target Analyte List	Chemical	CAS Number	PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
			Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
			Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
			Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
			HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
			(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Accnaphthene	(V)	83-32-9	4.08E+03		4.08E+03	4.08E+04		4.08E+04
Acetone	(V)	67-64-1	1.02E+04		1.02E+04	1.02E+05		1.02E+05
Aldrin		309-00-2	2.21E+00	1.62E-01	1.62E-01	2.21E+01	1.62E+00	1.62E+00
Aluminum		7429-90-5	2.28E+04		2.28E+04	2.28E+05		2.28E+05
Anthracene	(V)	120-12-7	2.04E+04		2.04E+04	2.04E+05		2.04E+05
Antimony		7440-36-0	4.09E+01		4.09E+01	4.09E+02		4.09E+02
Aroclor 1016		12674-11-2	4.64E+00	3.54E+01	4.64E+00	4.64E+01	3.54E+02	4.64E+01
Aroclor 1221		11104-28-2		1.24E+00	1.24E+00		1.24E+01	1.24E+01
Aroclor 1232		11141-16-5		1.24E+00	1.24E+00		1.24E+01	1.24E+01
Aroclor 1242		53469-21-9		1.24E+00	1.24E+00		1.24E+01	1.24E+01
Aroclor 1248		12672-29-6		1.24E+00	1.24E+00		1.24E+01	1.24E+01
Aroclor 1254		11097-69-1	1.33E+00	1.24E+00	1.24E+00	1.33E+01	1.24E+01	1.24E+01
Aroclor 1260		11096-82-5		1.24E+00	1.24E+00		1.24E+01	1.24E+01
Arsenic		7440-38-2	2.75E+01	2.22E+00	2.22E+00	2.75E+02	2.22E+01	2.22E+01
Barium		7440-39-3	2.64E+03		2.64E+03	2.64E+04		2.64E+04
Benzene	(V)	71-43-2	3.41E+01	2.05E+01	2.05E+01	3.41E+02	2.05E+02	2.05E+02
alpha-BHC		319-84-6		5.24E-01	5.24E-01		5.24E+00	5.24E+00



Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

	Volatile Organics		PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
			Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
			Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
	CAS		Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
Target Analyte List	Number		HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
beta-BHC	319-85-7			1.84E+00	1.84E+00		1.84E+01	1.84E+01
delta-BHC	319-86-8							
gamma-BHC (Lindane)	58-89-9		2.66E+01	2.55E+00	2.55E+00	2.66E+02	2.55E+01	2.55E+01
Benzo(a)anthracene	56-55-3			3.49E+00	3.49E+00		3.49E+01	3.49E+01
Benzo(a)pyrene	50-32-8			3.49E-01	3.49E-01		3.49E+00	3.49E+00
Benzo(b)fluoranthene	205-99-2			3.49E+00	3.49E+00		3.49E+01	3.49E+01
Benzo(k)fluoranthene	207-08-9			3.49E+01	3.49E+01		3.49E+02	3.49E+02
Benzoic Acid (at pH 7)	65-85-0		4.09E+05		4.09E+05	4.09E+06		4.09E+06
Benzyl Alcohol	100-51-6		3.07E+04		3.07E+04	3.07E+05		3.07E+05
Beryllium	7440-41-7		9.21E+01	1.31E+02	9.21E+01	9.21E+02	1.31E+03	9.21E+02
bis(2-chloroethyl)ether	(V) 111-44-4			3.48E+00	3.48E+00		3.48E+01	3.48E+01
bis(2-chloroisopropyl)ether	(V) 39638-32-9		4.09E+03	5.47E+01	5.47E+01	4.09E+04	5.47E+02	5.47E+02
bis(2-ethylhexyl)phthalate	117-81-7		1.47E+03	1.97E+02	1.97E+02	1.47E+04	1.97E+03	1.97E+03
Bromodichloromethane	(V) 75-27-4		2.04E+03	6.17E+01	6.17E+01	2.04E+04	6.17E+02	6.17E+02
Bromoform	(V) 75-25-2		2.04E+03	3.73E+02	3.73E+02	2.04E+04	3.73E+03	3.73E+03
Bromomethane (methyl bromide)	(V) 74-83-9		1.93E+01		1.93E+01	1.93E+02		1.93E+02
2-Butanone (methyl ethyl ketone)	(V) 78-93-3		1.92E+04		1.92E+04	1.92E+05		1.92E+05
Butylbenzylphthalate	85-68-7		1.47E+04		1.47E+04	1.47E+05		1.47E+05

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

Target Analyte List	CAS Number	PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
		Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
		Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
		Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
		HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
Cadmium (water)	7440-43-9	5.11E+01	1.74E+02	3.11E+01	5.11E+02	1.74E+03	5.11E+02
Cadmium (food)	7440-43-9	9.62E+01	1.74E+02	9.62E+01	9.62E+02	1.74E+03	9.62E+02
Carbon disulfide	(V) 75-15-0	1.51E+03		1.51E+03	1.51E+04		1.51E+04
Carbon tetrachloride	(V) 56-23-5	8.15E+00	8.21E+00	8.15E+00	8.15E+01	8.21E+01	8.15E+01
alpha-Chlordane	5103-71-9	4.39E+01	9.44E+00	9.44E+00	4.39E+02	9.44E+01	9.44E+01
beta-Chlordane	5103-74-2	4.39E+01	9.44E+00	9.44E+00	4.39E+02	9.44E+01	9.44E+01
gamma-Chlordane	12789-03-6	4.39E+01	9.44E+00	9.44E+00	4.39E+02	9.44E+01	9.44E+01
4-Chloroaniline	106-47-8	2.95E+02		2.95E+02	2.95E+03		2.95E+03
Chlorobenzene	(V) 108-90-7	6.09E+02		6.09E+02	6.09E+03		6.09E+03
Chloroethane (ethyl chloride)	(V) 75-00-3	8.88E+03	1.32E+03	1.32E+03	8.88E+04	1.32E+04	1.32E+04
Chloroform	(V) 67-66-3	1.92E+00	1.04E+01	1.92E+00	1.92E+01	1.04E+02	1.92E+01
Chloromethane (methyl chloride)	(V) 74-87-3	1.03E+02	3.71E+01	3.71E+01	1.03E+03	3.71E+02	3.71E+02
2-Chloronaphthalene	(V) 91-58-7	8.18E+03		8.18E+03	8.18E+04		8.18E+04
2-Chlorophenol	(V) 95-57-8	5.11E+02		5.11E+02	5.11E+03		5.11E+03
Chromium III	16065-83-1	1.53E+05		1.53E+05	1.53E+06		1.53E+06
Chromium VI	18540-29-9	2.27E+02	2.68E+01	2.68E+01	2.27E+03	2.68E+02	2.68E+02
Chrysene	218-01-9		3.49E+02	3.49E+02		3.49E+03	3.49E+03
Cobalt	7440-48-4	1.55E+02		1.55E+02	1.55E+03		1.55E+03

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

Target Analyte List	CAS Number	PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
		Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
		Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
		Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
		HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
Copper	7440-50-8	4.09E+03		4.09E+03	4.09E+04		4.09E+04
Cyanide	57-12-5	2.04E+03		2.04E+03	2.04E+04		2.04E+04
4,4-DDD	72-54-8		1.43E+01	1.43E+01		1.43E+02	1.43E+02
4,4-DDE	72-55-9		1.01E+01	1.01E+01		1.01E+02	1.01E+02
4,4-DDT	50-29-3	4.58E+01	1.01E+01	1.01E+01	4.58E+02	1.01E+02	1.01E+02
Dibenz[a,h]anthracene	53-70-3		3.49E-01	3.49E-01		3.49E+00	3.49E+00
Dibenzofuran	132-64-9	2.95E+02		2.95E+02	2.95E+03		2.95E+03
Dibromochloromethane	124-48-1	1.47E+03	3.29E+01	3.29E+01	1.47E+04	3.29E+02	3.29E+02
Di-n-butylphthalate	84-74-2	7.37E+03		7.37E+03	7.37E+04		7.37E+04
1,2-Dichlorobenzene (o-)	(V) 95-50-1	3.12E+03		3.12E+03	3.12E+04		3.12E+04
1,4-Dichlorobenzene (p-)	(V) 106-46-7	2.72E+03	8.40E+01	8.40E+01	2.72E+04	8.40E+02	8.40E+02
3,3-Dichlorobenzidine	91-94-1		6.13E+00	6.13E+00		6.13E+01	6.13E+01
1,1-Dichloroethane	(V) 75-35-3	2.25E+03		2.25E+03	2.25E+04		2.25E+04
1,2-Dichloroethane	(V) 107-06-2	4.74E+01	1.06E+01	1.06E+01	4.74E+02	1.06E+02	1.06E+02
1,1-Dichloroethene	(V) 75-35-4	9.20E+02	1.70E+00	1.70E+00	9.20E+03	1.70E+01	1.70E+01
1,2-Dichloroethene (total)	(V) 540-59-0	9.20E+02		9.20E+02	9.20E+03		9.20E+03
2,4-Dichlorophenol (at pH 6.8)	120-83-2	3.07E+02		3.07E+02	3.07E+03		3.07E+03
1,2-Dichloropropane	(V) 78-87-5	3.45E+01	5.63E+01	3.45E+01	3.45E+02	5.63E+02	3.45E+02

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

	Volatile Organics	CAS Number	PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
			Adult WLRW Noncarcinogenic	Adult WLRW Carcinogenic	Adult WLRW Soil PRG	Adult WLRW Noncarcinogenic	Adult WLRW Carcinogenic	Adult WLRW Soil PRG
Target Analyte List			Soil PRG HQ = 0.1	Soil PRG Risk = 1E-06	Risk = 1E-06 or HQ = 0.1	Soil PRG HQ = 1.0	Soil PRG Risk = 1E-05	Risk = 1E-05 or HQ = 1.0
cis-1,3-Dichloropropene	(V)	10061-01-3	9.74E+02	6.57E-01	6.57E-01	9.74E+03	6.57E+00	6.57E+00
trans-1,3-Dichloropropene	(V)	10061-02-6	9.74E+02	6.57E-01	6.57E-01	9.74E+03	6.57E+00	6.57E+00
Dieldrin		60-57-3	3.69E+00	1.72E-01	1.72E-01	3.69E+01	1.72E+00	1.72E+00
Diethylphthalate		84-66-2	5.90E+04		5.90E+04	5.90E+05		5.90E+05
2,4-Dimethylphenol	(V)	105-67-9	2.04E+03		2.04E+03	2.04E+04		2.04E+04
Dimethylphthalate		131-11-3	7.37E+05		7.37E+05	7.37E+06		7.37E+06
4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	(V)	534-52-1	1.02E+02		1.02E+02	1.02E+03		1.02E+03
2,4-Dinitrophenol		51-28-5	2.04E+02		2.04E+02	2.04E+03		2.04E+03
2,4-Dinitrotoluene		121-14-2	2.04E+02	5.63E+00	5.63E+00	2.04E+03	5.63E+01	5.63E+01
2,6-Dinitrotoluene		606-20-2	1.02E+02	5.63E+00	5.63E+00	1.02E+03	5.63E+01	5.63E+01
Di-n-octylphthalate		117-84-0	1.47E+03		1.47E+03	1.47E+04		1.47E+04
Endosulfan I		959-98-8	4.42E+02		4.42E+02	4.42E+03		4.42E+03
Endosulfan II		33213-65-9	4.42E+02		4.42E+02	4.42E+03		4.42E+03
Endosulfan sulfate		1031-07-8	4.42E+02		4.42E+02	4.42E+03		4.42E+03
Endosulfan (technical)		115-29-7	4.42E+02		4.42E+02	4.42E+03		4.42E+03
Endrin (technical)		72-20-8	2.21E+01		2.21E+01	2.21E+02		2.21E+02
Ethylbenzene	(V)	100-41-4	5.62E+03	4.25E+02	4.25E+02	5.62E+04	4.25E+03	4.25E+03
Fluoranthene		206-44-0	2.72E+03		2.72E+03	2.72E+04		2.72E+04

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

[illegible]

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

	Volatile Organics	CAS	PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
			Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
			Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
		CAS	Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
Target Analyte List		Number	HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
4-Methyl-2-pentanone (methyl isobutyl ketone)	(V)	108-10-1	1.64E+03		1.64E+03	1.64E+04		1.64E+04
2-Methylphenol (o-cresol)		95-48-7	3.69E+03		3.69E+03	3.69E+04		3.69E+04
4-Methylphenol (p-cresol)		106-44-5	3.69E+02		3.69E+02	3.69E+03		3.69E+03
Molybdenum		7439-98-7	5.11E+02		5.11E+02	5.11E+03		5.11E+03
Naphthalene	(V)	91-20-3	3.09E+02		3.09E+02	3.09E+03		3.09E+03
Nickel (soluble)		7440-02-0	2.04E+03		2.04E+03	2.04E+04		2.04E+04
2-Nitroaniline		88-74-4	1.67E+03		1.67E+03	1.67E+04		1.67E+04
Nitrobenzene	(V)	98-95-3	3.32E+01		3.32E+01	3.32E+02		3.32E+02
4-Nitrophenol	(V)	100-02-7	8.18E+02		8.18E+02	8.18E+03		8.18E+03
n-Nitrosodiphenylamine	(V)	86-30-6		7.81E+02	7.81E+02		7.81E+03	7.81E+03
n-Nitrosodipropylamine		621-64-7		5.47E-01	5.47E-01		5.47E+00	5.47E+00
Pentachlorophenol		87-86-5	1.56E+03	1.62E+01	1.62E+01	1.56E+04	1.62E+02	1.62E+02
Phenol		108-95-2	6.13E+04		6.13E+04	6.13E+05		6.13E+05
Pyrene		129-00-0	2.21E+03		2.21E+03	2.21E+04		2.21E+04
Selenium		7782-49-2	5.11E+02		5.11E+02	5.11E+03		5.11E+03
Silver		7440-22-4	5.11E+02		5.11E+02	5.11E+03		5.11E+03
Strontium		7440-24-6	6.13E+04		6.13E+04	6.13E+05		6.13E+05
Styrene	(V)	100-42-5	1.23E+04		1.23E+04	1.23E+05		1.23E+05

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

	Volatile Organics		PRGs at Risk = 1E-06 and HQ = 0.1			PRGs at Risk = 1E-05 and HQ = 1		
			Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW	Adult WLRW
			Noncarcinogenic	Carcinogenic	Soil PRG	Noncarcinogenic	Carcinogenic	Soil PRG
		CAS	Soil PRG	Soil PRG	Risk = 1E-06	Soil PRG	Soil PRG	Risk = 1E-05
Target Analyte List		Number	HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
1,1,2,2-Tetrachloroethane	(V)	79-34-5	6.13E+03	1.00E+01	1.00E+01	6.13E+04	1.00E+02	1.00E+02
Tetrachloroethene	(V)	127-18-4	1.02E+03	6.15E+01	6.15E+01	1.02E+04	6.15E+02	6.15E+02
Tin		7440-31-5	6.13E+04		6.13E+04	6.13E+05		6.13E+05
Toluene	(V)	108-88-3	3.13E+03		3.13E+03	3.13E+04		3.13E+04
Toxaphene		8001-35-2		2.50E+00	2.50E+00		2.50E+01	2.50E+01
1,2,4-Trichlorobenzene	(V)	120-82-1	9.23E+02		9.23E+02	9.23E+03		9.23E+03
1,1,1-Trichloroethane	(V)	71-55-6	7.97E+03		7.97E+03	7.97E+04		7.97E+04
1,1,2-Trichloroethane	(V)	79-00-5	4.09E+02	2.36E+01	2.36E+01	4.09E+03	2.36E+02	2.36E+02
Trichloroethene	(V)	79-01-6	2.75E+01	1.96E+00	1.96E+00	2.75E+02	1.96E+01	1.96E+01
2,4,5-Trichlorophenol		95-95-4	1.02E+04		1.02E+04	1.02E+05		1.02E+05
2,4,6-Trichlorophenol		88-06-2		3.47E+02	3.47E+02		3.47E+03	3.47E+03
Uranium (soluble salts)		No CAS NO	3.07E+02		3.07E+02	3.07E+03		3.07E+03
Vanadium		7440-62-2	7.15E+02		7.15E+02	7.15E+03		7.15E+03
Vinyl acetate		108-05-4	9.63E+04		9.63E+04	9.63E+05		9.63E+05
Vinyl chloride	(V)	75-01-4	1.25E+02	4.12E+00	4.12E+00	1.25E+03	4.12E+01	4.12E+01
Xylenes (total)	(V)	1330-20-7	2.04E+05		2.04E+05	2.04E+06		2.04E+06
Zinc		7440-66-6	3.07E+04		3.07E+04	3.07E+05		3.07E+05

Table 8. Preliminary Remediation Goals for Wildlife Refuge Worker

	Volatile Organics	PRGs at Risk = 1E-06 and HQ = 0.1						PRGs at Risk = 1E-05 and HQ = 1					
		Adult WLRW	Adult WLRW Noncardiogenic	Adult WLRW Cardiogenic	Adult WLRW Soil PRG	Adult WLRW Risk = 1E-06 or HQ = 0.1	Adult WLRW Soil PRG	Adult WLRW	Adult WLRW Noncardiogenic	Adult WLRW Cardiogenic	Adult WLRW Soil PRG	Adult WLRW Risk = 1E-05 or HQ = 1.0	Adult WLRW
Target Analyte List													
Nitrite													
Nitrite													
Ammonium (as Ammonia)													
Fluoride (as fluoride)													



Table 9. Preliminary Remediation Goals for Rural Groundwater

Target Analyte List	CAS Number	Groundwater PRGs at Risk = 1E-06 and HQ = 0.1			Groundwater PRGs at Risk = 1E-05 and HQ = 1.0		
		Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident
		Noncarcinogenic	Carcinogenic	Groundwater	Noncarcinogenic	Carcinogenic	Groundwater
		Groundwater Risk = 1E-06 or HQ = 0.1	Groundwater Risk = 1E-06 or HQ = 0.1	Risk = 1E-06 or HQ = 0.1	Groundwater Risk = 1E-05 or HQ = 1.0	Groundwater Risk = 1E-05 or HQ = 1.0	Risk = 1E-05 or HQ = 1.0
Chemical		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Acenaphthene	(V) 83-32-9	2.19E-01		2.19E-01	2.19E+00		2.19E+00
Acetone	(V) 67-64-1	3.65E-01		3.65E-01	3.65E+00		3.65E+00
Aldrin	309-00-2	1.10E-04	5.01E-06	5.01E-06	1.10E-03	5.01E-05	5.01E-05
Aluminum	7429-90-5	3.65E+00		3.65E+00	3.65E+01		3.65E+01
Anthracene	(V) 120-12-7	1.10E+00		1.10E+00	1.10E+01		1.10E+01
Antimony	7440-36-0	1.46E-03		1.46E-03	1.46E-02		1.46E-02
Aroclor 1016	12674-11-2	2.56E-04	1.22E-03	2.56E-04	2.56E-03	1.22E-02	2.56E-03
Aroclor 1221	11104-28-2		4.26E-05	4.26E-05		4.26E-04	4.26E-04
Aroclor 1232	11141-16-3		4.26E-05	4.26E-05		4.26E-04	4.26E-04
Aroclor 1242	53469-21-9		4.26E-05	4.26E-05		4.26E-04	4.26E-04
Aroclor 1248	12672-29-6		4.26E-05	4.26E-05		4.26E-04	4.26E-04
Aroclor 1254	11097-69-1	7.30E-05	4.26E-05	4.26E-05	7.30E-04	4.26E-04	4.26E-04
Aroclor 1260	11096-82-3		4.26E-05	4.26E-05		4.26E-04	4.26E-04
Arsenic	7440-38-2	1.10E-03	5.68E-05	5.68E-05	1.10E-02	5.68E-04	5.68E-04
Barium	7440-39-3	2.56E-01		2.56E-01	2.56E+00		2.56E+00
Benzene	(V) 71-43-2	1.10E-02	1.55E-03	1.55E-03	1.10E-01	1.55E-02	1.55E-02
alpha-BHC	319-84-6		1.35E-05	1.35E-05		1.35E-04	1.35E-04
beta-BHC	319-85-7		4.73E-05	4.73E-05		4.73E-04	4.73E-04
gamma-BHC	319-86-8						
Gamma-BHC (Lindane)	58-89-9	1.10E-03	6.55E-05	6.55E-05	1.10E-02	6.55E-04	6.55E-04
Benz(a)anthracene	56-55-3		1.17E-04	1.17E-04		1.17E-03	1.17E-03
Benz(a)pyrene	50-32-8		1.17E-05	1.17E-05		1.17E-04	1.17E-04
Benz(b)fluoranthene	205-99-2		1.17E-04	1.17E-04		1.17E-03	1.17E-03
Benz(k)fluoranthene	207-08-9		1.17E-03	1.17E-03		1.17E-02	1.17E-02
Benzoic Acid (at pH 7)	65-85-0	1.46E+01		1.46E+01	1.46E+02		1.46E+02
Benzyl Alcohol	100-51-6	1.10E+00		1.10E+00	1.10E+01		1.10E+01
Beryllium	7440-41-7	7.30E-03		7.30E-03	7.30E-02		7.30E-02
bis(2-chloroethyl)ether	(V) 111-44-4		7.74E-05	7.74E-05		7.74E-04	7.74E-04
bis(2-chloroisopropyl)ether	(V) 39638-32-9	1.46E-01	1.22E-03	1.22E-03	1.46E+00	1.22E-02	1.22E-02

Groundwater PRGs at Risk - IE-05 and HQ1

[illegible]

Table 9. Preliminary Remediation Goals for Rural Groundwater

Target Analyte List	CAS Number	Groundwater FRGs at Risk = 1E-06 and HQ = 0.1			Groundwater FRGs at Risk = 1E-05 and HQ = 1		
		Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident
		Noncarcinogenic Groundwater	Carcinogenic Groundwater	Groundwater	Noncarcinogenic Groundwater	Carcinogenic Groundwater	Groundwater
		HQ = 0.1	Risk = 1E-06	Risk = 1E-06	HQ = 1.0	Risk = 1E-05	Risk = 1E-05
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Chemical							
Dibenz(a,h)anthracene	53-70-3		1.17E-05	1.46E-02	1.46E-01	1.17E-04	1.46E-01
Dibenzofuran	132-64-9	1.46E-02					
Dibenzofuran	124-48-1	7.30E-02	1.01E-03	1.01E-03	7.30E-01	1.01E-02	1.01E-02
Dibenzofuran	84-74-2	3.65E-01			3.65E-01		
1,2-Dichlorobenzene (o-)	95-50-1	3.29E-01			3.29E-01		
1,4-Dichlorobenzene (p-)	106-46-7	1.10E-01	3.53E-03	3.53E-03	1.10E-01	3.53E-02	3.53E-02
1,3-Dichlorobenzene	91-94-1		1.89E-04	1.89E-04		1.89E-03	1.89E-03
1,4-Dichlorobenzene	75-34-3	3.65E-01			3.65E-01		
1,2-Dichlorobenzene	107-06-2	1.10E-01	9.36E-04	9.36E-04	1.10E-01	9.36E-03	9.36E-03
1,3-Dichlorobenzene	75-35-4	3.29E-02	1.42E-04	1.42E-04	3.29E-01	1.42E-03	1.42E-03
1,2,3-Trichlorobenzene (total)	540-39-0	3.29E-02			3.29E-01		
2,4-Dichlorophenol (at pH 6.8)	120-82-2	1.10E-02			1.10E-01		
1,2-Dichloropropane	78-87-5		1.25E-03	1.25E-03		1.25E-02	1.25E-02
1,1,1-Trichloroethane	10061-01-3	1.10E-01	8.52E-04	8.52E-04	1.10E-01	8.52E-03	8.52E-03
trans-1,2-Dichloropropane	10061-02-6	1.10E-01	8.52E-04	8.52E-04	1.10E-01	8.52E-03	8.52E-03
Dieldrin	60-57-1	1.83E-04	5.32E-06	5.32E-06	1.83E-03	5.32E-05	5.32E-05
Diethylphthalate	84-66-2	2.92E+00			2.92E+01		
2,4-Dimethylphenol	105-67-9	7.30E-02			7.30E-01		
Dimethylphthalate	131-11-3	3.65E+01			3.65E+02		
4,4'-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)	534-52-1	3.65E-03			3.65E-02		
2,4-Dichlorophenol	51-28-5	7.30E-03			7.30E-02		
2,4-Dinitrophenol	121-14-2	7.30E-03	1.25E-04	1.25E-04	7.30E-02	1.25E-03	1.25E-03
2,6-Dinitrophenol	606-20-2	3.65E-03	1.25E-04	1.25E-04	3.65E-02	1.25E-03	1.25E-03
Di-n-octylphthalate	117-84-0	7.30E-02			7.30E-01		
Endosulfan I	959-98-8	2.19E-02			2.19E-01		
Endosulfan II	33213-65-9	2.19E-02			2.19E-01		
Endosulfan sulfate	1031-07-8	2.19E-02			2.19E-01		
Endosulfan (technical)	115-29-7	2.19E-02			2.19E-01		
Endrin (technical)	72-20-3	1.10E-03			1.10E-02		

Table 9. Preliminary Remediation Goals for Rural Groundwater

Groundwater PRGs at Risk = 1E-05 and HQ1		Groundwater PRGs at Risk = 1E-06 and HQ = 0.1		Groundwater PRGs at Risk = 1E-05 and HQ = 0.1	
1 Target Analyte List	Number	HQ = 0.1	Risk = 1E-06	HQ = 0.1	Risk = 1E-05
Chemical		(mg/kg)		(mg/kg)	
Edible/Feed	(V)	100-41-4	3,65E-01	3,65E-01	3,65E+00
Fluoranthene		206-44-0	1,46E-01	1,46E-01	1,46E+00
Phenol	(V)	86-73-7	2,19E-01	2,19E-01	2,19E+00
Hepachlor epoxide		1024-57-3	4,75E-05	1,89E-05	1,89E-04
Hexachlorobenzene		118-74-1	2,92E-03	5,32E-05	9,36E-05
Hexachlorocyclopentadiene		87-68-3	7,30E-04	1,09E-03	5,32E-04
Hexachlorocyclopentadiene		77-47-4	2,19E-02	7,30E-04	1,09E-02
Hexachlorocyclopentadiene		67-72-1	3,65E-03	2,19E-02	2,19E-01
Indeno(1,2,3-cd)pyrene		193-39-5	6,08E-03	1,17E-04	6,08E-02
Iron		7439-89-6	1,10E+00	1,10E+00	1,17E-03
Isophthalic acid		78-59-1	7,30E-01	8,96E-02	1,10E+01
Lead		7439-92-1	7,30E-02	4,00E+02	7,30E+00
Lithium		7439-93-2	7,30E-02	7,30E-02	8,96E-01
Magnesium		7439-95-4	7,30E-02	7,30E-02	8,96E-01
Manganese (MnO2)		7439-96-5	5,11E-01	5,11E-01	8,96E-01
Manganese (MnO)		7439-97-6	5,11E-01	5,11E-01	8,96E-01
Methylchloride (dichloromethane)	(V)	75-09-2	2,19E-01	1,14E-02	1,14E-01
2-Methyl-2-pentanol (methyl isobutyl alcohol)	(V)	108-10-1	2,92E-01	2,92E-01	2,92E+00
2-Methyl-2-pentanol (n-pentanol)		95-48-7	1,83E-01	1,83E-01	2,92E+00
4-Methylphenol (p-cresol)		106-44-5	1,83E-02	1,83E-02	2,92E+00
Molybdenum		7439-98-7	1,83E-02	1,83E-02	2,92E+00
Naphthalene	(V)	91-20-3	7,30E-02	7,30E-02	2,92E+00
Nickel (soluble)		7440-02-0	7,30E-02	7,30E-02	2,92E+00
2-Nitroaniline		88-71-4	1,83E-03	1,83E-03	2,92E+00
Nitrobenzene	(V)	98-95-3	1,83E-03	1,83E-03	2,92E+00
4-Nitrophenol	(V)	100-02-7	2,92E-02	2,92E-02	2,92E+00

Table9. Preliminary Remediation Goals for Rural Groundwater

Target Analyte List	CAS Number	Groundwater PRGs at Risk = 1E-06 and HQ = 0.1			Groundwater PRGs at Risk = 1E-05 and HQ1		
		Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident
		Noncarcinogenic Groundwater	Carcinogenic Groundwater	Groundwater Risk = 1E-06 or HQ = 0.1	Noncarcinogenic Groundwater	Carcinogenic Groundwater	Groundwater Risk = 1E-05 or HQ = 1.0
Chemical		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
n-Nitrosodiphenylamine	(V) 86-30-6		1.74E-02	1.74E-02		1.74E-01	1.74E-01
n-Nitrosodipropylamine	621-64-7		1.22E-05	1.22E-05		1.22E-04	1.22E-04
Pentachlorophenol	87-86-5	1.10E-01	7.10E-04	7.10E-04	1.10E+00	7.10E-03	7.10E-03
Phenol	108-95-2	2.19E+00		2.19E+00	2.19E+01		2.19E+01
Pyrene	129-00-0	1.10E-01		1.10E-01	1.10E+00		1.10E+00
Selenium	7782-49-2	1.83E-02		1.83E-02	1.83E-01		1.83E-01
Silver	7440-22-4	1.83E-02		1.83E-02	1.83E-01		1.83E-01
Strontium	7440-24-6	2.19E+00		2.19E+00	2.19E+01		2.19E+01
Styrene	(V) 100-42-5	7.30E-01		7.30E-01	7.30E+00		7.30E+00
1,1,2,2-Tetrachloroethane	(V) 79-34-5	2.19E-01	4.26E-04	4.26E-04	2.19E+00	4.26E-03	4.26E-03
Tetrachloroethene	(V) 127-18-4	3.65E-02	1.64E-03	1.64E-03	3.65E-01	1.64E-02	1.64E-02
Tin	7440-31-5	2.19E+00		2.19E+00	2.19E+01		2.19E+01
Toluene	(V) 108-88-3	7.30E-01		7.30E-01	7.30E+00		7.30E+00
Toxaphene	8001-35-2		7.74E-05	7.74E-05		7.74E-04	7.74E-04
1,2,4-Trichlorobenzene	(V) 120-82-1	3.65E-02		3.65E-02	3.65E-01		3.65E-01
1,1,1-Trichloroethane	(V) 71-55-6	1.02E+00		1.02E+00	1.02E+01		1.02E+01
1,1,2-Trichloroethane	(V) 79-00-5	1.46E-02	1.49E-03	1.49E-03	1.46E-01	1.49E-02	1.49E-02
Trichloroethene	(V) 79-01-6	1.10E-03	2.13E-04	2.13E-04	1.10E-02	2.13E-03	2.13E-03
2,4,5-Trichlorophenol	95-95-4	3.65E-01		3.65E-01	3.65E+00		3.65E+00
2,4,6-Trichlorophenol	88-06-2		7.74E-03	7.74E-03		7.74E-02	7.74E-02
Uranium (soluble salts)	88-06-2	1.10E-02		1.10E-02			
Vanadium	7440-62-2	2.56E-02		2.56E-02	2.56E-01		2.56E-01
Vinylacetone	108-05-4	3.65E+00		3.65E+00	3.65E+01		3.65E+01
Vinylchloride	(V) 75-01-4	1.10E-02	6.08E-05	6.08E-05	1.10E-01	6.08E-04	6.08E-04
Xylene (total)	(V) 1330-20-7	7.30E+00		7.30E+00	7.30E+01		7.30E+01
Zinc	7440-66-6	1.10E+00		1.10E+00	1.10E+01		1.10E+01
Nitrate	14797-55-8	5.84E+00		5.84E+00	5.84E+01		5.84E+01
Nitrite	14797-65-0	3.65E-01		3.65E-01	3.65E+00		3.65E+00

Table 9. Preliminary Remediation Goals for Rural Groundwater

		Groundwater PRGs at Risk = 1E-06 and HQ = 0.1			Groundwater PRGs at Risk = 1E-05 and HQ1		
		Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident	Rural Resident
		Noncarcinogenic	Cardiogenic	Groundwater	Noncarcinogenic	Cardiogenic	Groundwater
	CAS	Groundwater	Groundwater	Risk = 1E-06	Groundwater	Groundwater	Risk = 1E-05
Target Analyte List	Number	HQ = 0.1	Risk = 1E-06	or HQ = 0.1	HQ = 1.0	Risk = 1E-05	or HQ = 1.0
Concentration		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Ammonium (as Ammonia)	7664-41-7						
Flutamide (as Flutamide)	7783-41-4	2.19E-01		2.39E-01	2.19E+00		2.19E+00

Table 9. Preliminary Remediation Goals for Ecological Receptors

Analyte	NOAEL or LOAEL	Deer Mouse - Insectivore	Deer Mouse - Omnivore	Herbi- vorous Mouse (LOAEL)	Insect- ivorous Mouse (LOAEL)	Preble's Meadow Jumping Mouse (NOAEL)	Mourning Dove (LOAEL)	Prairie Dog (LOAEL)	American Kestrel (LOAEL)	Inverte- brate	Lowest Eco PRG (1)	Limiting Receptor	Worker PRG 1E-05 or HQ=1
Acetone	1	2.89E+05	1.48E+03	8.06E+02	2.76E+05	2.65E+02	NV	2.11E+02	NV	NV	2.11E+02	Prairie Dog	1.02E+05
Aroclor 1254	1	7.87E+00	1.57E+01	3.20E+03	5.56E+02	8.59E+02	1.44E+03	3.71E+02	1.17E+03	4.90E-04	3.71E+02	Prairie Dog	1.24E+01
Arsenic	1	1.67E+02	1.11E+02	8.89E+01	1.76E+02	4.92E+01	3.64E+01	2.16E+01	1.85E+02	5.00E+01	3.64E+01	Prairie Dog	2.22E+01
Benzo(a)anthracene	1	1.22E+04	5.66E+02	3.91E+03	1.13E+04	2.46E+03	NV	8.00E+02	NV	NV	8.00E+02	Prairie Dog	3.49E+01
Benzo(a)pyrene	1	6.79E+03	6.90E+02	6.10E+03	6.71E+03	3.84E+03	NV	1.11E+03	NV	2.57E+01	2.57E+01	Invertebrate	3.49E+00
Benzo(b)fluoranthene	1	6.79E+03	6.90E+02	5.36E+03	6.71E+03	3.37E+03	NV	1.01E+03	NV	NV	1.01E+03	Prairie Dog	3.49E+01
Benzo(k)fluoranthene	1	6.11E+03	6.86E+02	5.36E+03	6.10E+03	3.37E+03	NV	1.01E+03	NV	NV	1.01E+03	Prairie Dog	3.49E+02
Beryllium	1	2.48E+01	1.22E+01	8.71E+00	2.60E+01	1.50E+01	NV	2.15E+00	NV	NV	2.15E+00	Prairie Dog	9.21E+02
Carbon Tetrachloride	1	3.32E+02	5.78E+02	2.42E+03	3.61E+02	8.32E+01	NV	6.18E+02	NV	NV	8.32E+01	PMJM <sup>(3)</sup>	8.15E+01
Chloroform	1	4.38E+02	3.96E+02	3.92E+02	4.75E+02	2.92E+02	NV	1.01E+02	NV	NV	1.01E+02	Prairie Dog	1.91E+01
Hexachloroethane	1	7.02E+00	1.40E+01	8.54E+03	3.10E+03	3.77E+03	NV	1.99E+03	NV	NV	1.99E+03	Prairie Dog	7.37E+02
Lead	1	3.46E+01	6.54E+01	6.42E+02	3.76E+01	1.27E+02	9.77E+01	1.49E+02	2.56E+01	6.88E+03	2.56E+01	Kestrel	1.00E+03
Methyl Ethyl Ketone	1	1.80E+05	3.02E+03	1.66E+03	1.84E+05	6.42E+02	NV	4.33E+02	NV	NV	4.33E+02	Prairie Dog	1.90E+05
Methylene Chloride	1	7.37E+02	2.35E+02	1.52E+02	7.95E+02	1.29E+02	NV	3.95E+01	NV	NV	3.95E+01	Prairie Dog	2.53E+03
Tetrachloroethene	1	4.93E+02	7.82E+02	2.06E+03	5.35E+02	3.75E+01	NV	5.29E+02	NV	NV	5.29E+02	PMJM <sup>(3)</sup>	6.51E+02
Trichloroethene	1	6.40E+02	9.48E+02	1.98E+03	6.96E+02	1.49E+03	NV	5.09E+02	NV	NV	5.09E+02	Prairie Dog	1.96E+01
Toluene	1	1.97E+02	3.38E+02	1.28E+03	2.15E+02	1.28E+02	NV	3.29E+02	NV	NV	3.29E+02	PMJM <sup>(3)</sup>	3.13E+04
Uranium	1	1.54E+02	2.07E+02	3.26E+02	1.64E+02	1.96E+02	2.21E+04	6.78E+01	2.85E+04	NV	6.78E+01	Prairie Dog	3.07E+03
Vanadium	1	8.42E+02	1.41E+03	3.71E+03	8.67E+02	4.45E+03	2.92E+03	4.36E+02	4.33E+02	NV	4.36E+02	Kestrel	7.15E+03
Vinyl Chloride	1	9.34E+00	2.62E+00	1.66E+00	1.01E+01	1.66E-01	NV	4.31E-01	NV	NV	4.31E-01	PMJM <sup>(3)</sup>	1.83E-01

All units are in mg/kg

601  
601

Final RFCA: IGD  
Appendix N  
May 28, 2003

- (1) Ecological PRGs less than Worker PRGs denoted with shading.
  - (2) The Invertebrate receptor has the lowest PRG for Arctocor 1254, however, little confidence is placed on the data used to calculate that value. Therefore, the lowest vertebrate PRG was used.
  - (3) The PRG for the Preble's Meadow Jumping Mouse is the lowest PRG. If this PRG is exceeded, an evaluation of the habitat where the sample was collected should be made. If the habitat is not suspected to be suitable for the Preble's Meadow Jumping Mouse, the next lowest PRG should be used.
- NV = No reliable PRG could be calculated due to a lack of toxicity information for the receptor.